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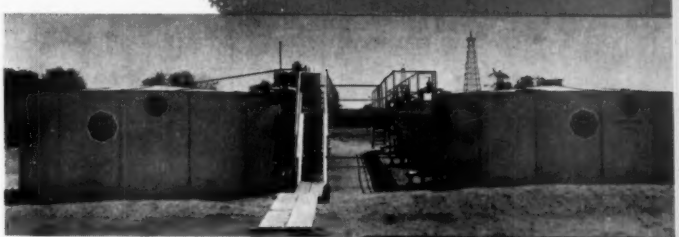

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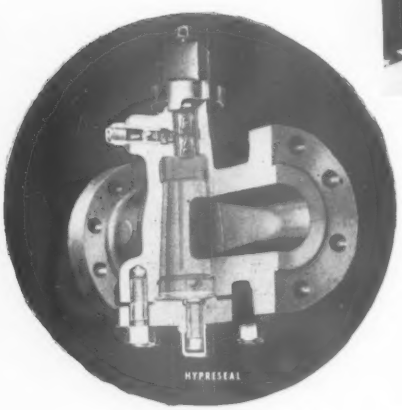

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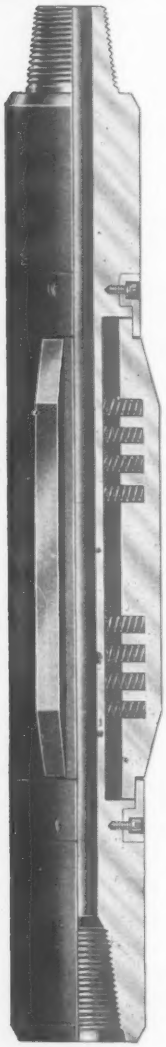
SCRAPING CASING

the follow-up step in well completion



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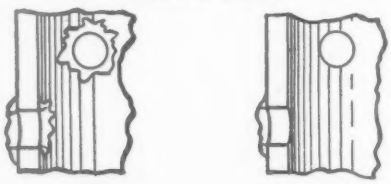

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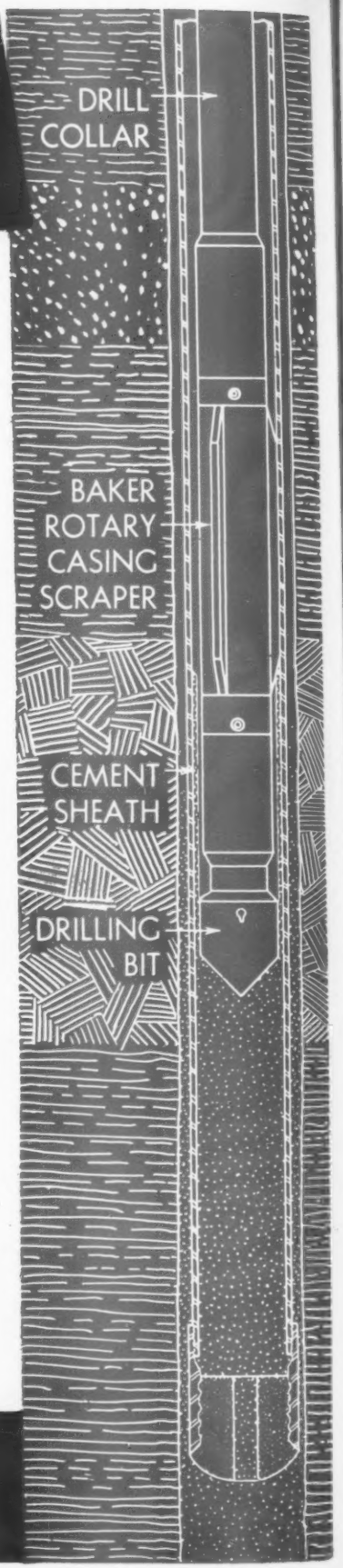

BAKER OIL TOOLS, INC.

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Trends

Crude-Oil Production
By States—Page 172

CRUDE-OIL STOCKS 216,355,000 bbl. as of July 14—down 895,000 bbl. One year ago 226,513,000 bbl.

GASOLINE STOCKS 85,401,000 bbl. as of July 14—down 928,000 bbl. One year ago 80,854,000 bbl.

RESIDUAL FUEL-OIL STOCKS 41,489,000 bbl. as of July 14—up 735,000 bbl. One year ago 54,804,000 bbl.

GAS OIL AND DISTILLATE STOCKS 34,804,000 bbl. as of July 14—up 1,127,000 bbl. One year ago 36,907,000 bbl.

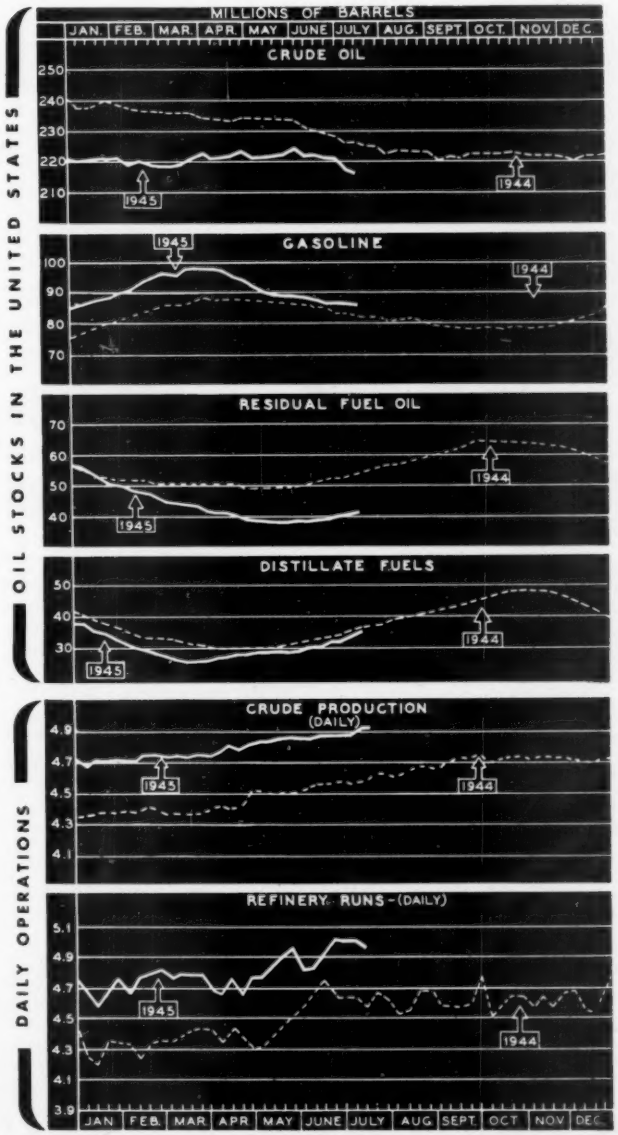
CRUDE-OIL PRODUCTION 4,939,600 bbl. as of July 21—up 2,650 bbl. One year ago 4,593,600 bbl.

REFINERY RUNS 4,945,000 bbl. daily week ended July 14—down 61,000 bbl. One year ago 4,588,000 bbl.

REHABILITATION of liberated oil fields in Borneo is strictly a Dutch and British operation. All planning and ordering of equipment required to restore producing fields and refineries to operation was done in London with approval of the Allied high command. This procedure, according to information in Washington, reduces the Petroleum Administration for War to little more than a rubber-stamp agency for approving equipment orders as a mere formality. PAW retains nominal power of review but has so far authorized priorities for British and Dutch purchase orders without question. Part of this reluctance on the part of PAW to look behind the British and Dutch orders stems from an investigation of world-wide military-petroleum operations more than a year ago by a subcommittee of the Senate.

THE world-girdling senators criticized the policy which made deep drafts on petroleum supplies in the United States and left British and other Allied production at substantially prewar levels or less. With liberation of Borneo, the British and Dutch are in excellent position to argue successfully for all field and refinery equipment necessary. There remains the serious question of how much liberated Borneo's petroleum can contribute to direct military supplies. Selected crudes from Tarakan are suitable for cargo-ship bunkers after a mild heat treatment to lower the flash point but the fuel oil thus obtained would be entirely unsuitable for Navy fleet consumption.

NETHERLANDS military officials this week confirmed reports that a group of petroleum experts were en route to Tarakan and Balikpapan for the purpose of rehabilitating fields and refineries. Only a skeleton force of oil-trained troops landed with the invasion forces and their effective work has been limited by numbers and inadequate equipment. American and British oil companies, it is understood, are making more extensive plans for rehabilitation of producing and refining properties on Sumatra and Java. Plans for restoring American properties in other parts of the East Indies were made months ago and low priorities assigned to the projected equipment requirements. Higher priorities, it is understood, have been assigned to assure delivery in the near future.



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Final Congressional Action Gives Nod to Intangibles Deduction

WASHINGTON. — Congressional action has been completed on House Concurrent Resolution 50 which declares that the Bureau of Internal Revenue correctly interpreted the intent of Congress in writing the present regulations relating to tax treatment of the intangible costs of drilling oil and gas wells. The legality of these regulations had been challenged by a decision, later altered, of the Fifth Circuit Court of Appeals in a suit against F. H. E. Oil Co.

The Senate adopted the resolution by a vote of 51 to 16 after a very lengthy debate not on the merits but on proper constitutional methods of achieving the result.

Chief opposition came from Sen. Abe Murdock of Utah, who argued that a concurrent resolution, which is not signed by the president, has no force of law, and that the proper method would be to enact a joint resolution which the president could either sign or veto. Others argued that one Congress has no right to interpret the intent of the Congress which passed the original depletion law 27 years ago, or protested that this was an attempt to dictate to the courts how pending cases should be decided.

Sen. Robert M. LaFollette of Wisconsin said:

"I think it has absolutely no legal effect whatsoever, and I would have no respect for any court which would even take judicial notice of the fact that we had taken this ridiculous action."

On the other side, many senators argued that of course Congress has the right to express its interpretation of the intent of its legislation, and that courts traditionally consider congressional intent.

Murdock proposed a substitute stating that Congress intends to write the questioned regulations into the tax laws at the earliest possible date, but this raised a storm of protest on the ground that it is even more ridiculous to try to interpret future actions of Congress.

At any rate, Congress is now on record as saying that it thinks the intangible drilling regulations are legal, and this resolution can be used in court actions for whatever value the court cares to give it.

Hallanan Scores OPA Defense Of Crude-Price Policies

WASHINGTON.—A real shortage of crude oil threatens to impair the war program and most of the blame for this can be laid to the Office of Price Administration for refusal to increase the crude-oil-price ceilings, according to Walter S. Hallanan, chairman of the production committee of the Petroleum Industry War Council.

His views were expressed in a statement filed with the Senate petroleum resources committee in rebuttal to a statement filed by Orville D. Judd of the fuel price division. In earlier testimony Hallanan had cited the low crude price as one of the reasons for the threatened oil shortage, and Judd had replied with a defense of the OPA position.

In vigorous language Hallanan castigated the OPA for evading the issues, refusing to recognize replacement costs and higher labor and material charges, presenting the stripper-well subsidy as a solution of the problem, and citing the profits of certain oil companies instead of examining actual production costs. He particularly attacked Judd's characterization of exploratory work as gambling and a "supreme bid for fortune."

Hallanan told the committee that the War Production Board has been advised by the joint committee on critical materials and products, composed of representatives of the Army and Navy and the WPB, that petroleum is one of the products "which are now, or expected to be, in short supply and which threaten to limit the production of essential products or the fulfillment of programs of high urgency".

Crude-oil stocks are now down to the lowest point in many years, Hallanan said and added that they are grossly inadequate for the nation's present needs. He said that inventories were being reduced alarmingly, that production of crude oil is at the highest peak in history, and that wells are being produced in excess of the maximum efficient rate of withdrawal. He charged that the OPA has misrepresented the situation and "at the same hour the Petroleum Administration for War is today compelled to go on a hunt into foreign lands for another barrel of oil to keep faith with our fighting forces."

"Today we are on the hunt in every oil-producing land for more crude to take care of our over-all commitments;" he continued, "our drilling rigs, our manpower, our pipe, our materials of every kind are being sent to the Caribbean area and to every country that has promise of supplying some oil to develop sufficient reserves—while the OPA stands in the way of those reserves being developed within our own borders through the failure to grant an adequate price to justify the exploration activities of the American oil producer."

Subsidy OPA's Only Answer

Recalling that a price increase had been advocated by PAW, by various Congressional committees, the PIWC, and other public and private agencies, Hallanan said that the only answer of the OPA had been to grant a subsidy to wells which produced less than 9 bbl. per day. Referring to recent testimony before the committee by Judd, Hallanan said that Judd had confessed that the subsidy was not designed to stimulate exploration, and added that this was an admission on the part of OPA that it had "wholly ignored the problem of finding enough new oil to replace reserves being drawn upon for the war effort." He said that oil being discovered today amounted to only one-third of the nation's production.

"Judd's statement," declared Hallanan, "wholly ignores the fact that during the last 5 years there has been a heavy decline in the discovery of new pools of oil—that drilling costs have increased 50 to 75 per cent—and that the 'finding' costs of new oil according to figures of PAW have increased from 0.103 cents to 0.605 cents per barrel.

"Judd's statement refers to the fact that the present average price of oil in the United States is at its highest level since 1929, but wholly ignores the fact that in the same period the cost of finding oil has increased by an enormous percentage. The average price of $1.27 per barrel for crude in 1929 in relation to the cost of finding and producing oil would be equal to an average price of more than $2 per barrel today. Judd further ignores the fact that in 1918 all commodities registered 131.3, while the price index of petroleum products was 135.3. In 1944, the price index of all commodities registered 104.0, while the price index of petroleum products was 63.9."

Another Record Production Rate Certified to Oil States

WASHINGTON. — A production rate of 5,240,000 bbl. daily of all petroleum liquids has been certified to the various oil-producing states for production during August 1945. The rate for August represents an increase of 16,900 bbl. daily above the previous month's all-time record rate of 5,223,100 bbl. daily, the Petroleum Administration for War pointed out.

The production rate certified for August includes 4,900,900 bbl. daily of crude oil and 339,100 bbl. daily of natural gasoline and other petroleum liquids. The crude-oil rate certified for August is 11,000 bbl. daily greater than the rate certified for production during July.

The rate certified for production of natural gasoline and other petroleum liquids during August is 5,900 bbl. daily more than the 333,200 bbl. daily certified for production during July.

The production rate certified for the East Coast states (PAW District 1) is 64,000 bbl. daily, an increase of 1,000 bbl. daily over the July certification. The higher rate is certified to take into consideration the normal seasonal crude-oil increase in productive capacity of fields in New York.

For the Midwestern states (PAW District 2), the crude-oil rate certified for August remains unchanged at 950,000 bbl. a day. There is an increase of 800 bbl. daily in the rate of natural gasoline and other petroleum liquids, bringing the total to 998,000 bbl. a day.

The total petroleum-liquids rate certified for the Southwestern states (District 3) for August is 3,008,700 bbl. daily, 14,700 bbl. daily above the July rate. This daily increase consists of an additional 10,000 bbl. of crude oil and 4,700 bbl. of natural gasoline and other petroleum liquids.

The additional 10,000 bbl. daily of crude oil is certified for production from Texas in order to meet the programmed runs of refiners dependent upon Texas for their supply of crude oil.

The production rates certified for August for the Rocky Mountain states and California (Districts 4 and 5, respectively) remain relatively unchanged from those certified for July, 156,000 bbl. daily for Colorado, Wyoming and Montana, and 1,012,900 bbl. a day for California.

PRODUCTION RATES IN BARRELS PER CALENDAR DAY

	August 1945	
	Certified total petroleum liquids	Est. nat. gasoline and condensate
District 1—		
New York	13,000	.....
Pennsylvania	37,800	800
West Virginia	13,200	5,000
Total	64,000	5,800
District 2—		
Illinois	212,000	12,000
Indiana	13,000	.....
Kansas	278,500	4,500
Kentucky	30,600	2,600
Michigan	47,800	800
Nebraska	1,000	.....
Ohio	7,500	500
Oklahoma	408,000	28,000
Total	998,400	48,400
District 3—		
Alabama	500	.....
Arkansas	85,400	5,400
Louisiana	402,000	42,000
Mississippi	53,000	.....
New Mexico	111,800	6,800
Texas	2,356,000	*166,000
Total	3,008,700	220,200
District 4—		
Colorado	12,000	.....
Montana	22,300	300
Wyoming	121,700	3,500
Total	156,000	3,800
District 5—		
California	1,012,900	†60,900
Total U. S.	5,240,000	339,100

*Includes 16,000 bbl. per day separator condensate over and above anticipated plant production. †Includes 5,200 bbl. daily Paloma condensate production.

World-Wide Fuel Shortage Will Test Industry's Resources

WASHINGTON.—The prospective world-wide shortage of fuel of all kinds for the duration of the Japanese war was the chief topic of discussion at the meeting of the Petroleum Industry War Council here last week.

From its own committees and from officials of the Petroleum Administration for War the council heard that to fight the Jap war and supply enough oil to Europe to avoid an economic breakdown will tax United Nations resources to the limit, and that there will be a shortage of crude oil, of fuel, diesel oil and kerosene, of drilling materials and equipment, and of tankers and tank cars.

Domestic crude production will be kept beyond the maximum efficient rate, foreign production will be stepped up including liberated areas, more crude will be imported to this country, and virtually all tankers will be used on foreign runs, PIWC was told. The peak of the shortages will be felt the first and second quarters of 1946, though fuel oil will be extremely tight all next winter.

The council heard off-the-record reports on American discoveries regarding Germany's wartime oil and synthetic fuel industries, Allied plans for rehabilitating oil facilities in occupied and liberated areas, and Europe's current and future needs for petroleum products. Military officials warned that tankers would not long be so available for coastwise movement as at present, and that the Army and Navy should not be expected to help out in making up fuel-oil deficiencies on the East Coast as they have on some previous occasions.

Petroleum Administrator Harold L. Ickes made a brief appearance before the council to discuss Europe's fuel needs, but he appeared more concerned with coal than with oil, predicting anarchy in Europe this winter unless some way is found to supply more coal soon.

Considerable time was devoted to discussion of the forthcoming investigation of the natural-gas industry by the Federal Power Commission. Chairman Basil Manly and Commissioners Leland Olds and Claude L. Draper explained the procedural plan previously announced for the hearings and protested that the FPC has no interest in the oil industry as such and has no intention of attempting to control production or marketing of natural gas. In spite of this many council members bitterly complained about the investigation, saying it will require much manpower to prepare for the hearings and might lead to further federal regulation. Some asked that the council take formal steps to protest the investigation. A resolution of regret on the death of Phil T. Williams was adopted.

The next regular meeting of PIWC was scheduled for September 26.

Restricted Field List Revised

HOUSTON. — Effective July 18, the Petroleum Administration for War issued a newly revised list of the fields in District 3 that are designated as "Restricted Areas" under PAO 11. The effect of the revocation of the old list and issuance of the new is to remove 62 fields in District 3 from the restricted classification.

XUM

Ickes Determined to Clarify His Status

WASHINGTON. — Virtual confirmation that he is seeking a showdown on his Cabinet status was given by Secretary of the Interior Harold L. Ickes at his appearance before the Petroleum Industry War Council last week.

He volunteered the information that he didn't know when he was going to London to negotiate a new Anglo-American petroleum treaty, had made no preparations to go, and was not going to go "the same way Stettinius went to San Francisco."

The resignation of Edward R. Stettinius as Secretary of State was accepted by President Truman immediately after completion of the United Nations Conference on International Organization at San Francisco and he was then appointed head of the American delegation to the United Nations Organization.

When President Truman a couple of weeks ago announced that Ickes would soon go to London on the oil treaty the parallel was drawn by Washington comentators with the inference that Ickes would be "kicked upstairs" out of the Cabinet and made head of the American section of the International Petroleum Commission contemplated by the treaty. It was also noted that Secretary of the Treasury Henry Morgenthau recently became so annoyed with rumors that he would be replaced in the fall that he demanded a clarification of his status and when the answer failed to satisfy him he resigned at once, refusing to remain in office until the President's return from Europe.

The "Old Curmudgeon's" blunt remark to the PIWC was taken to mean that he is demanding that the President either keep him indefinitely or accept his resignation now.

Stripper-Well Adjustments Now Handled by RFC

WASHINGTON. — In conformity with a joint resolution of Congress, Defense Supplies Corp. was dissolved July 1, and all of its functions and authority were transferred to Reconstruction Finance Corp. Business formerly conducted by DSC is now handled by RFC through the newly created Office of Defense Supplies. This obviates the necessity for amendment of any contract or arrangement previously entered into by DSC.

RFC will handle stripper-well compensatory adjustments in the same manner and under the same regulations as were conducted by DSC. Applicants should use their present supply of forms, notwithstanding such forms were prepared originally for use by DSC. All correspondence and claims in connection with stripper-well compensatory adjustments should be addressed to W. E. Unzicker, assistant treasurer, 811 Vermont Avenue, N.W., Washington 25, D. C.

Government to Dispose of Alien-Owned Oil Concern

SHREVEPORT.—Instead of being returned to the original owner, as was done at the end of World War 1, The Amerlagene, Inc., a Shreveport oil concern, has been listed among the alien-owned properties in Louisiana to be disposed of by the Government. James E. Markham, alien property custodian, placed the total value of alien-owned business property in Louisiana at $95,250.

The Amerlagene, with estimated value of $15,000, is owned by Overseas Finance Corp., a personal holding company of Fritz van Opel, an internee, whose nationality is recorded as German.

Schilthuis Resigns PAW Post, Returns to Humble

WASHINGTON.—Ralph J. Schilthuis has resigned as assistant director of the production division, Petroleum Administration for War, and returned to his former civilian post as supervising engineer in the production department of Humble Oil & Refining Co., Houston.

Schilthuis was called in July 1941 to the Office of the Petroleum Coordinator, predecessor of PAW, as the second man in the production division. He played a major role in organizing the division, in shaping the policies and programs on oil production, and in directing the division's work.

Research Foundation Urged on Congress

WASHINGTON. — That Congress create and establish a National Research Foundation was urged by Dr. Vannevar Bush in a recent report entitled "Science—the Endless Frontier." Bush is director of the Office of Scientific Research and Development.

While the Foundation would be established by Congress, it should consist of nine members appointed by the president and responsible directly to him alone, Bush stated in his report. It should consist of five branches: Medical, natural science, national defense, scientific personnel and education, and publications and scientific collaboration. Adequate support for such a program from the federal Government would be about $33,000,000 at first, and probably would increase with time, the Bush report states.

Humble Appeal in Ingleside Case Dismissed by Court

HOUSTON.—Petroleum Administration for War remains in possession of Humble Oil & Refining Co.'s refinery at Ingleside, following the action of the Fifth Circuit Court of Appeals, in New Orleans, in dismissing Humble's appeal that seizure of the plant be set aside. The Government took over the plant on the ground that it was threatened by a strike, which would interrupt production of needed gasoline. Humble contended no strike was threatened.

Imports Unlikely to Affect Demand for Texas Oil

AUSTIN.—Texas oil men do not expect the demand for Texas crude to be seriously affected this year by the big increases in imports from South America to meet war requirements. At the monthly state-wide proration hearing July 18 the Texas Railroad Commission fixed the allowable production for August at 2,360,771 bbl. This is 4,771 bbl. more than was certified by Petroleum Administration for War.

Production in the Talco field, Franklin and Titus counties, will be increased from 24 days' production this month to 28 in August, raising its average daily allowable from 19,433 bbl. to 24,987. Sulphur Bluff field, Hopkins County, has 28 producing days this month and will be exempt from shutdown in August, raising its allowable from 3,513 bbl. to 3,889.

The commission did not raise the allowables in West Texas, where PAW raised its request 10,000 bbl. a day. Chairman Olin Culberson said current allowables will furnish all the crude PAW wants.

Texas crude-oil production in July has reached an all-time peak of 2,209,400 bbl. daily.

Price Increase for West Texas Ordovician Fields

DALLAS.—Following the grant of permission by the Office of Price Administration, the Magnolia Petroleum Co. announced a 13-cent price increase, retroactive to July 1, in the Abell and Apco-Warner Ordovician fields in West Texas. The new schedule starts with 93 cents for oil below 25° gravity with a 2-cent differential per degree to a top of $1.25 for 40° gravity and above, based on 100 per cent tank tables.

Signal Corps Photo

One of several pipe-line bridges which Army engineers built across streams crossed by the military products line through Burma

THIS WEEK

PRODUCTION — Highest production rate in history, 5,240,000 bbl. daily of all petroleum liquids, recommended for August by PAW. . . . Increase of 16,900 over July. . . . Rising requirements ascribed to Pacific war. . . . ¶Industry warned that record-smashing crude output must continue. . . . ¶Country's production at new high, 4,939,600 bbl. daily. . . . Up 2,650. . . . California, Illinois, and Kansas main contributors to gain. . . . Drop of 8,606 bbl. in Michigan. . . .

EASIER—PAW announces 90-day suspension of regulation tank-car movement in District 2. . . . Further easing of controls seen. . . . ¶Scheduling of orders for valves, pipe fittings for naval destroyer-escort construction program no longer required. . . . ¶Allocation controls removed from chlorinated paraffin. . . . ¶All rationing restrictions removed from remaining supply of 1942 automobiles. . . . ¶Some A-card holders likely to get new tires by next February or March, rubber director predicts. . . .

FOREIGN—Turkish appeal for oil from British and American sources in Iraq provides problem for Big Three to settle. . . . ¶Oil experts go to liberated Tarakan and Balikpapan to push restoration of pools. . . . ¶Lebanese Government grants Socony-Vacuum and New Jersey Standard permission to build two refineries at Tripoli. . . . ¶One proposed plan to deprive Germany of a master key to war is to prevent rebuilding of synthetic-oil industry. . . .

SCARCE—"Worst fuel shortage of war" prophesied by Ickes. . . . Urges campaigns to make homes, other buildings heat-tight by insulation, etc. . . . ¶Chairman production committee of PIWC blames "real shortage of crude" on OPA's refusal to grant higher prices. . . . Subsidy an opiate; "eases pain, but doesn't cure." . . . ¶Only alcohol type of antifreeze available for civilians next winter, WPB says. . . . Short of methanol. . . .

NEW—Revolutionary safety fuel has power of 100,-octane gasoline, but lighted match doesn't ignite it. . . . Primarily for aircraft engines. . . . Makes refueling in air practicable. . . . ¶Helium employed as sleuth to reveal facts about underground movement of oil and gas. . . . Use thus as tracer gas expected to provide tool long sought in subsurface study. . . .

CONTROLS—President Honolulu Oil Co. says main obstacle to reconversion is "Government has its fangs in plants." . . . Recommends selling government-owned facilities to highest bidders. . . . ¶Ickes opposes dissolution of PRC, of which he's president. . . . Demonstrated its value, he says. . . . ¶Defense Supply Corp. dissolved. . . . Functions taken over by RFC. . . .

TRANSPORTATION — Inland waterways handling 1,000,000 bbl. oil and products daily. . . . Includes heavy movement aviation gasoline. . . . ¶ODT, operating several seized truck lines in North Dakota, joins other lines in seeking 10 per cent increase in intrastate rates.

TIRES—Shell road-testing "half-and-half" tires. . . . One-half regular synthetic rubber. . . . Other contains new plasticizing agent made from petroleum. . . . Expect to overcome cracking, chipping. . . . ¶Government cancels 12 projects for increasing output of large truck tires. . . . Completion would have cost $86,000,000.

XUM

INTERNATIONAL

Marian Cody Appointed Latin-American Writer

Marian C. Cody has been appointed editorial representative for The Oil and Gas Journal and its affiliated Latin American publication, Petroleo Interamericano, at Caracas, Venezuela. She is a graduate from the University of Oklahoma, receiving a Bachelor of Science degree in geology from that institution in June, 1940.

Immediately after graduation, she was employed by Amerada Petroleum Corp. in the geological department, Tulsa, and remained with the company in that position until November 1942. The following June she joined her husband in Barranquilla, Colombia, and began work in the geololgical laboratory of the Tropical Oil Co., doing micropaleontological research. From Barranquilla she was transferred to the company's headquarters in Bogota. In April 1944 Mrs. Cody was employed by the Creole Petroleum Corp. of Venezuela in the exploration department of that organization.

MARIAN C. CODY

She is an aviation enthusiast, holding a private pilot certificate. Her flying training, together with a Link trainer instructorship, was received from the Spartan School of Aeronautics in Tulsa.

Mrs. Cody will do general editorial work for the Journal, covering news developments in Venezuela and other South American countries, from her central location in Caracas. Feature material concerning exploration and geological articles will be her principal contribution to Petroleo Interamericano, along with personals and brief news developments concerning the Latin American petroleum industry.

New Venezuelan Field Discovered by Creole

Creole Petroleum Corp. has completed 1 Capacho as the discovery well in a new eastern Venezuelan field in the State of Anzoategui, approximately 30 kilometers (18.5) miles) southwest of the company's Mulata producing field.

The wildcat well is the first discovery producer completed on a new concession granted under the 1943 petroleum law. Initial production was 150 bbl. per day of 23° oil through casing perforations at selected intervals between 4,410-70 ft. The well was drilled to total depth of 4,988 ft. and 5½-in. pipe was set at 4,646 ft.

Location is 6.5 kilometers south of the Creole-Meneg paved road to Puerto La Cruz.

Creole 2 Capacho, a short distance north of the discovery well, is drilling below 4,445 ft.

The company completed 22 development producing wells during June. The most prolific producers resulted from eight completions in the B. C. F. field which had an average initial of 1,777 bbl. per day and were finished at average depth of 4,471 ft. Five new producing wells in the Mulata field produced at the average initial rate of 278 bbl. per day from average depth of 5,182 ft. Nine new wells in the Jusepin field produced at the average rate of 415 bbl. daily from average depth of 4,780 ft.

Turkey Seeks Oil From Anglo-American Group

Turkey is bidding for oil supplies from British and American sources in Iraq adding another problem to the list of territorial and economic questions in the Middle East.

The Ankara radio said last week that discussions were taking place with British and American representatives about Turkey's needs for oil.

"Turkey formerly got an important part of her oil requirements from Romania, but this has now stopped since part of Romania's oil goes to the Soviet Union as reparations and part on a commercial basis," the radio said. "The Turkish authorities are therefore on the lookout for sources of oil supplies to cover the future needs of the country. To free the Turkish economy from exclusive dependence on Soviet oil, discussions are going on with British and United States representatives. Iraq's oil wells are in the immediate neighborhood of our country."

Venezuela Production Record—958,394 Bbl. Daily

CARACAS. — Venezuelan crude-oil production reached an all-time high of 958,394 bbl. daily during the week ended July 16, topped by output of 506,445 bbl. per day from Creole Petroleum Corp. properties. The Shell group of companies produced 235,966 bbl. daily; Mene Grande Oil Co., 171,212; Consolidada, 29,000 bbl. (estimated); all other companies including Texas Co., Socony-Vacuum, Orinoco Oil Co., and British Controlled Oilfields, Ltd., 15,771 bbl.

Creole's production in June had slumped slightly to 445,722 bbl. daily compared with 458,618 bbl. daily in May. All of the reduction in June applied to Lake Maracaibo fields. A decline of 29,983 bbl. in daily average output from Creole's lake operations more than offset an increase of 17,087 bbl. per day in the production from eastern Venezuela properties. Creole's production in June 1944 averaged 407,040 bbl. daily. Last month's production of 158,102 bbl. per day from Creole's eastern Venezuelan properties was the highest on record.

Deepest Test Suspends Drilling at 13,033 Ft.

Venezuela's deepest well, the Caribbean Oil Co. R-801, in the center of the Cabimas field, State of Zulia, has suspended drilling operations at a depth of 13,033 ft., awaiting additional pipe.

The well was spudded February 11, 1944, with light rig, due to the difficulty of getting heavy equipment from the United States at that time. In October of 1944, drilling was suspended at 9,451 ft., the maximum safe depth for the light rig. A few months later, heavy equipment arrived from the United States, drilling was resumed, and the well carried to the present depth.

The hole is in good condition, and operators plan to continue drilling below 14,000 ft.

In addition to being the first well to exploit zones never before penetrated in this area, the well is being used as a training ground in the use of modern drilling equipment for 20 Venezuelan apprentices in the drilling department of the Caribbean Oil Co.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

So Little Help

IMMINENT liberation of the Netherlands East Indies and the Malayan Peninsula sharpens interest in the outlook for the oil industry's synthetic-rubber plants. The attitude of the Rubber Reserve Co., that the industry's future can be determined only after rehabilitation of natural-rubber production in the Far East, is unsatisfactory.

Petroleum refiners, copolymer-plant operators, and rubber manufacturers find little in the RRC policy to inspire confidence. In effect, RRC suggests that the complex synthetic-rubber industry wait until some indefinite date after the war is ended for the answer to questions that need resolving now. What could be less likely to encourage forward planning?

The only assurance given to the operators of synthetic plants is that their facilities will be needed at least until natural-rubber plantations are restored to production. There isn't even a helpful guess about how long restoration will require. Synthetic-rubber plants may have to produce at maximum capacity for 2, 3, or 4 years after Malaya is liberated. They may be needed only a few months.

The recently released report of RRC makes this self-evident statement: "Results of continuing developments with respect to the utility and cost . . . and the relationship between supply and demand for world needs will largely govern the future of the industry . . ."

Refiners are left to guess whether the Government will offer the butadiene plants for purchase by private industry. They are left to wonder what resulted from negotiations with the British.

Synthetic rubber has proven highly versatile in practically all service to which it was applied. In many special applications it has proven vastly superior to its natural prototype. The synthetic-rubber industry, therefore, will not expire with liberation of southern Asia. The product is certain to become standard in thousands of commercial applications, unless the industry perishes from inattention and malnutrition.

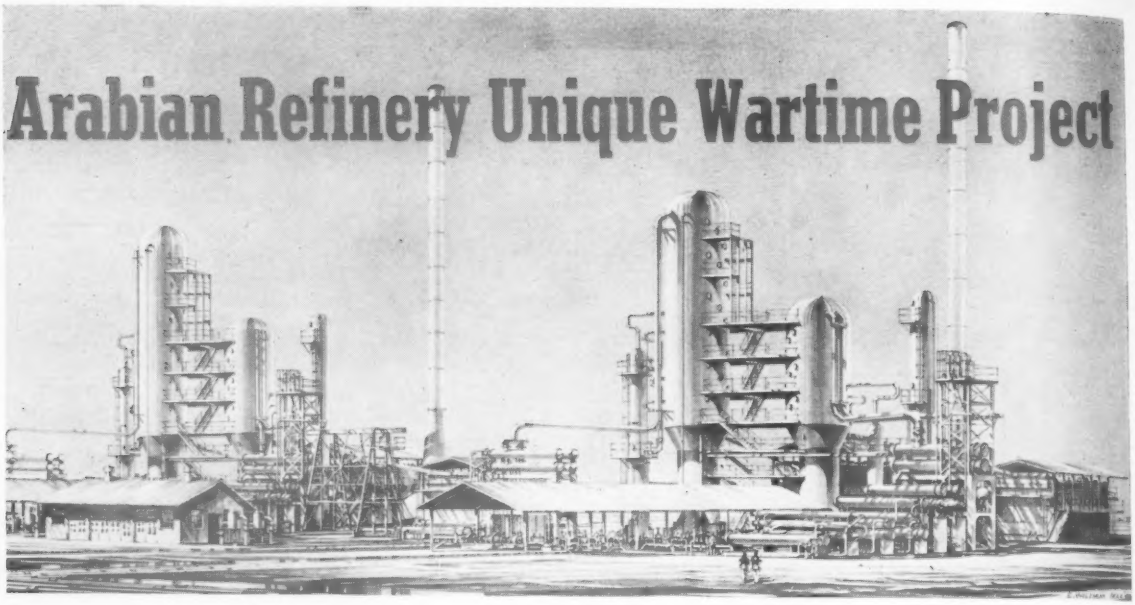
It would help if the Government would say that all or some fraction of existing productive capacity will be required to supply the minimum services for which synthetic rubber has superior quality. Beyond that point it should be the business of private industry to meet competition.

To the numerous war-service citations accruing to the petroleum industry may now be added another for its synthetic-rubber production record. Butadiene production from petroleum is only now reaching full potentialities. Diversion of feedstocks to aviation gasoline caused most delay. Certain equipment was delivered months behind schedule. Currently, however, the 14 petroleum-butadiene plants are yielding approximately 100 per cent of rated capacity.

The report shows most of the plants operating the butylene dehydrogenation process to be exceeding rated capacities by 25 per cent or more. The annual rated capacity of butadiene plants operating on petroleum feedstocks is 402,500 short tons. They consume 55,600 bbl. daily of butylene, butane, and naphtha. The naphtha process returns 17,500 bbl. per day of valuable byproducts, leaving net usage of petroleum for the butadiene program at 41,420 bbl. daily, which is 0.88 per cent of the daily oil production. The figures show strikingly that the petroleum industry has done a big job, with a minimum outlay of raw material.

XUM

Arabian Refinery Unique Wartime Project



Crude will be processed first in two three-stage crude stills each with 25,000-bbl.-per-day capacity

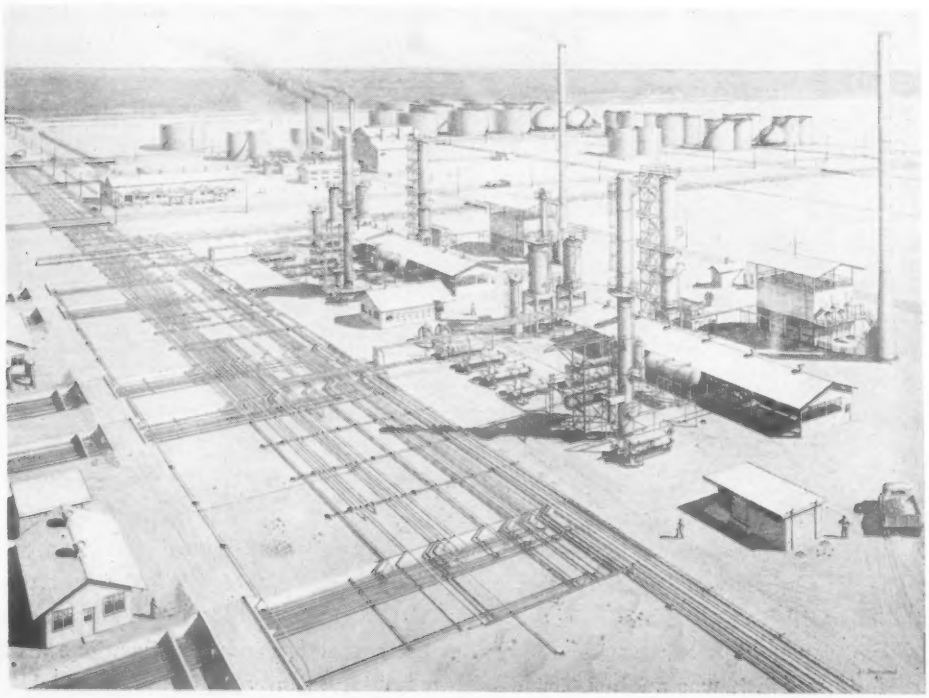
ENGINEERING difficulties had to be overcome in construction of the Arabian American Oil Co.'s refinery at Ras Tanura, in Saudi Arabia, which, with its daily crude capacity of 50,000 bbl., will soon be on stream and turning out war products for the United Nations. Special problems arose from the facts that the plant is 12,000 miles from the company's home office and that the only construction materials available locally are sand and rock. Everything else had to be imported.

A 10-in. crude line, of 60,000-bbl. daily capacity, connects the refinery with the Damman oil field, its principal source of supply.

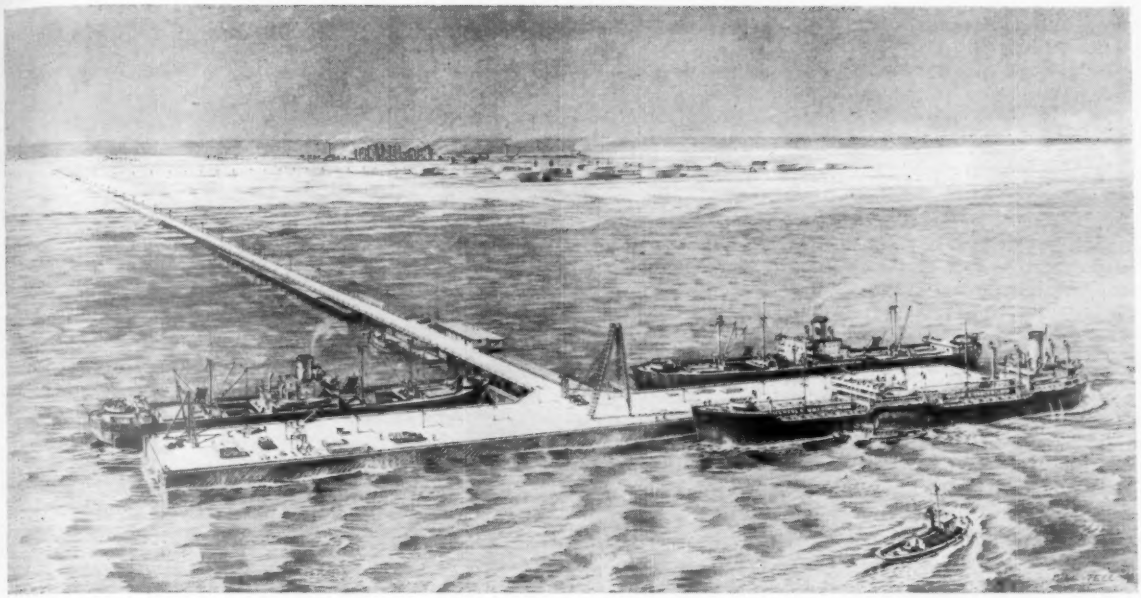
As a backup source of crude, a 12-in. pipe line will be installed from the Abqaiq field to Dhahran. A new discovery has been made at Qatif, on the route of the 10-in. line, which will provide an additional supply. The refinery is on the route of this pipe line on Ras Tanura Peninsula, 6 miles northwest of the terminal at Ras Tanura harbor. This point is as near to tide water as is practical.

The coastal area in this vicinity is characterized by sand dunes ranging up to 1,000 ft. wide and from 6 to 20 ft. above sea level. Back of these dunes the land is low-lying and at extremely high tides much of it is inundated.

The heavy straight-run gasoline will be run through two thermal reformers. The 18,000-kw. electric generating station is shown just beyond the reformer at left



A soil study indicated that it would be necessary to base all heavy structures on piles driven into a sandstone stratum, the surface of which lies about 10 ft. below the general ground elevation. These piles were driven and most of the foundations were poured without any general grading. Subsequently, the area was brought up to a general grade of 6 ft. above the mean high tide by borrowing from adjacent sand dunes and other high points. The fill will be completed by



Four-berth wharf is easily reached by ocean-going vessels. Shear leg derrick was used to unload equipment for refinery

The building of a large modern refinery, 12,000 miles from the company's home office, in a location where the only construction materials available locally were sand and rock, posed numerous engineering problems. This was the situation with regard to Arabian American Oil Co.'s 50,000-bbl. refinery at Ras Tanura, Saudi Arabia, which will soon be producing war-needed motor gasoline, diesel oil, and fuel oil at half capacity pending completion of a second unit later this year.

dredging sand from Tarut Bay.

There are two 25,000-bbl. crude stills. The straightrun gasoline will be reformed in two thermal reformers.

Other refinery equipment necessary to produce motor gasoline, diesel oil, and fuel oil is being provided.

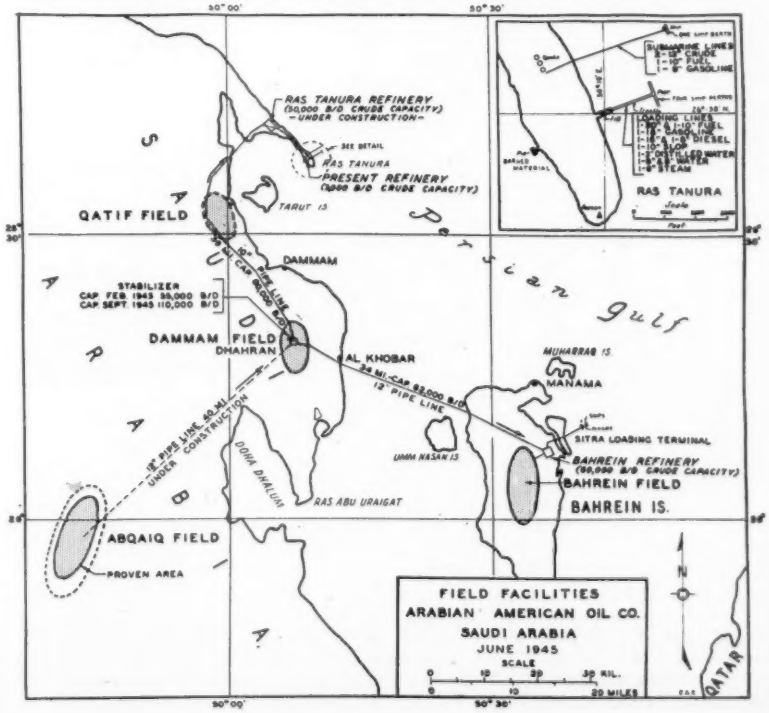
Steam and electricity will be supplied by a power plant for the refinery area and the adjacent activities. Three boilers of 220,000-lb. capacity will generate steam at 650 lb. pressure. Three 6,000-kw. turbine generators will generate 13,800-volt, 60 cycle, 3-phase power. The well water available contains about 3,000 parts per million of total solids and is limited in supply. Accordingly, the boiler plant is operated on a closed system and all condensate is conserved. Steam is bled off from the turbines and circulated through evaporators to produce steam to be used in the refinery.

Underground cables are used in the main electric distribution system within the refinery area.

Cooling and condensing water will be pumped from the Persian Gulf and disposed into Tarut Bay across the peninsula. The plant has been designed for a cooling water temperature of 95° F., which is reached quite generally throughout the summer months. Because of this high temperature, an unusual quantity of cooling water is required. The total demand is 70,000,000 gal. a day.

The intake is an open ditch extending 600 ft. out to sea to a low water depth of 10 ft. and protected by rock breakwaters on both sides. A low-lift pumphouse equipped with propeller-type pumps elevates the

Dammam field is main source of crude for Ras Tanura refinery, and supplies some crude to the Bahrein refinery. Abqaiq and Qatif fields will be backup sources



water into a concrete ditch which carries it approximately 2,000 ft. to a central settling basin. There the water passes through traveling screens to the suction of four refinery pressure system pumps located in a high-lift pumphouse, whence it is distributed through concrete pipe to the process units. After use the water is discharged through separators into Tarut Bay, on the opposite side of the refinery. Measures have been taken to provide against contamination of bay waters.

Five Pipe Lines

Approximately 4,000,000 bbl. of all welded steel storage and working tanks have been installed. Products from the refinery will be transferred through five pipe lines to shipping storage tanks at the terminal, 6 miles away.

In 1939 facilities were installed at the terminal to ship crude oil through a submarine loading system. The anchorage is in 50 ft. of water 3,300 ft. offshore. In 1940, a 3,000-bbl. refinery was built at the terminal to supply the local demand for products. This refinery has supplied the fleet of 400 automotive units required to build the refinery now under construction.

Ras Tanura is the only point along the Persian Gulf Coast of Saudi Arabia that is suitable for developing into a first-class deep-water harbor. A wide deep approach from the main fairway in the Persian Gulf has been marked so that any ocean-going vessel can make its way safely and conveniently into the harbor.

Superior Sells Kettleman Hills Property

LOS ANGELES.—Although no official announcement has been made, Standard Oil Co. of California and Kettleman North Dome Association have purchased the Huffman lease of Superior Oil Co. in the Kettleman North Dome field and Superior's natural gasoline plant on the same property. Superior's Kettleman Hills plant pioneered the use of refrigeration in conjunction with its processing equipment and represented a highly efficient unit. The Huffman lease contains eight wells and is located in Section 29-21s-17e.

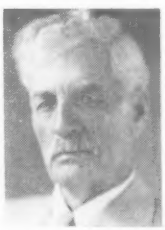
In the absence of any official announcement, it is impossible to determine how much was paid for the ⅞ production from the Huffman lease and how much was paid to Superior for the natural-gasoline plant. It is interesting to note, however, that Superior in its latest financial statement shows sale of capital assets in the amount of $3,611,161 which undoubtedly represents the amount received from the Huffman lease, equipment, and natural-gasoline plant. If the $611,161 represents the depreciated value of the natural-gasoline plant and $3,000,000 represents the wells and field equipment, the purchasers paid at the rate of approximately $4,300 per barrel of settled production.

Field reports indicate that Superior, Standard and Kenda did not see eye to eye regarding pressure maintenance of the Eocene sands at Kettleman Hills and injection of Eocene and Miocene gas into the Temblor.

Compliance with the projected plan would have forced Superior to cut its production of crude oil and natural gas and this in turn would seriously affect operation of the natural-gasoline plant. This disagreement led to the sale by Superior of its Kettleman interests at what appears to be a high price. Superior is reported to have produced over 15,000,000 bbl. of crude oil from the 160-acre Huffman lease. None of the principals would comment about the sale and purchase. Kettleman North Dome Association includes Standard of California, Tide Water Associated Oil Co., General Petroleum Corp., Union Oil Co., Shell Oil Co., Continental Oil Co., Seaboard Oil Co., Honolulu Oil Co., Standard Oil Co. of Texas and some other smaller interests.

Oil Prominent in Growth Of 50-Year-Old Tulsa Bank

July 29 will mark the fiftieth anniversary of The First National Bank & Trust Co., Tulsa, in whose life petroleum and the varied financial transactions that go with it have played a major role. When Jay Forsythe, founder, opened the bank for business it occupied a 25-ft. store room. It had paid-in capital of $10,000. Deposits totaled $1,061.60, and the first day's business yielded net profit of $13.15. Today the institution, occupying a modern banking building, has more than 30,000 accounts, total resources of around $140,000,000, and capital investment approaching $7,000,000. R. Otis McClintock, a director for 27 years and president for 17, has received country-wide recognition and was elected president of the national bank division of American Bankers' Association.



JAY FORSYTHE

R. O. McCLINTOCK

Correction

In its issue of July 21, The Oil and Gas Journal attributed to "National Council of I.P.A.A." a pronouncement made by National Council of Independent Petroleum Associations. The pronouncement urged separation of marketing from other branches of the oil industry, common-carrier operation of pipe lines, and withholding of tax-exemption benefits from purchasers of government property.

DEATHS

W. V. Bowles, 59, independent oil operator, died July 17 in Houston. His plans for attending college were discarded when the Spindletop oil boom started, and he brought in several producers there. For 18 years he was with The Texas Co. and was its production manager when he resigned in 1933 to enter private business. He was interested in sports and owned champion bird dogs.

Cassius P. McKee, 88, oil producer, died July 15 in Clintonville, Pa., where he had passed his life.

H. Birdsall Masterson, 47, for 25 years an independent oil operator in Houston, died in that city July 20.

J. Wallace MacAlpine, 47, electrical engineer with Standard Oil Development Co. in Linden, N. J., died July 18. He served in the Navy in the first World War.

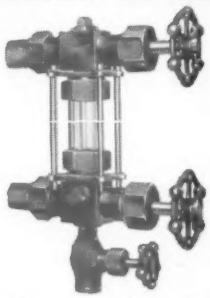
William P. Durkee, 48, who was vice president of Van Fleet-Durkee, Inc., later taken over by Shell Oil Co., Inc., died July 16 in Los Angeles. Durkee was educated at Dartmouth College, where he played fullback on the football team. He had served as vice president of Shell Union Oil Corp. of New York and Shell Oil Co. (California).

William H. Sulflow, 70, retired oil operator, died recently in Wichita, Kans.

E. R. Hutchison, 35, an executive of Arthur A. Cameron Oil Co., Evansville, Ind., died of a heart attack July 22. Before going to Evansville Hutchison was an attorney for The Carter Oil Co. in Tulsa.

Charles J. Dexter, 50, president of C. J. Dexter Co., petroleum sales organization at Haverford, Pa., died July 11.

PENBERTHY
"ALL IRON"
WATER GAGE SET



Extra heavy construction throughout. Body made from special high strength alloy iron, shanks alloy steel and trim stainless steel. Automatic and positive shut-off if glass breaks, valves self-cleaning, dripless drain cock permits gradual blowing off of gage. Conforms with A.P.I.-A.S.M.E. requirements.

The Heavy Duty "All Iron" is one of the complete line of Penberthy gages that meets every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT 2, MICH. Canadian Plant WINDSOR, ONTARIO

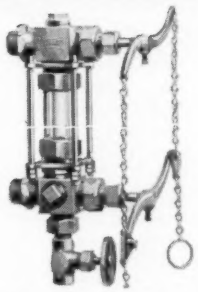
PENBERTHY
"REFLEX"
WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PENBERTHY
"NAVY TYPE"
WATER GAGE SET



Extra heavy construction made of "Navy Bronze Composition M." Important features include: regrinding valves, automatic and positive shut-off if glass breaks, valves self cleaning, glass offset from stems to allow cleaning from either end without loosening packing. Conform with A.P.I.-A.S.M.E. requirements.

The "Navy Type" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

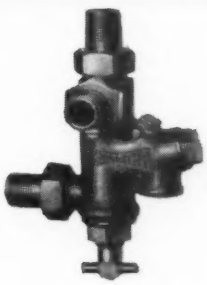
PENBERTHY INJECTOR CO.
DETROIT 2, MICH. Canadian Plant WINDSOR, ONTARIO

PENBERTHY
EJECTORS

Use the power of steam, air or water under pressure to lift liquids. Being simple jet pumps they have no moving parts and require no lubrication. A variety of models to meet different conditions. Also used as water heaters.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

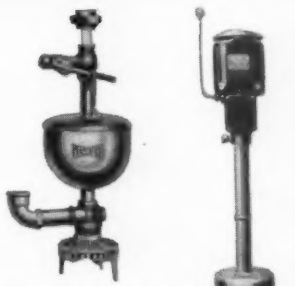
PENBERTHY
AUTOMATIC INJECTORS



The accepted method for assuring an uninterrupted supply of feed water to oil field boilers. Penberthy Automatic Injectors will supply feed water to boilers at minimum cost, are quickly and easily installed, reliable under most severe operating conditions, require little attention and no careful handling. Highest quality design and rugged construction.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PENBERTHY
SUMP PUMPS



Used wherever seepage water accumulates, the Penberthy Automatic Electric Sump Pump and the Penberthy Automatic Drainer (water or steam operated) have demonstrated their superiority in this service. Simple and rugged design—copper and bronze construction throughout.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

XUM

More Wells Proposed by Industry in Second 6 Months

by H. Stanley Norman

THE forecast of drilling operations for the last 6 months, studded with more than the usual uncertainties of such a projection, indicates that the petroleum industry will more than fulfill its assigned objective of 27,000 wells for the year. Replies to the Journal's questionnaire, supplemented with extrapolated data on the basis of first-half completions by remainder of the operating companies, indicates that nearly 15,000 wells will be drilled during the second 6 months.

Most of the uncertainties spring from duration of the Pacific war. The oil industry, in common with other business thinking, discounts the military program which is predicated on all-out warfare in the Pacific until the latter part of 1946. If the war continues another year and demand for domestic petroleum remains static at about 5 million barrels daily, the drilling program will be "managed" to hit the predetermined goal of 27,000 wells for 1945 and 30,000 for 1946. Petroleum Administration for War has the facilities with which to regulate drilling very close to the desired objective. By relaxing spacing restrictions, PAW is in position to stimulate or deemphasize development wells and can regulate exploratory drilling with almost the same degree of accuracy in its position as claimant agency for petroleum-industry materials.

There was an average of 1,707 rotary rigs in operation during May, accounting for slightly fewer than half of the total drilling wells at the start of that month. Active operations, including wells rigging up and locations earmarked for immediate drilling totaled 4,249 at the end of June compared to 3,930 at the end of May.

The difference between 3,509 wells which were drilling at the start of May and the total of 4,249 active operations, including wells drilling, or preparing to start, indicates a trend of high completions supported by current reports and statistics for recent weeks.

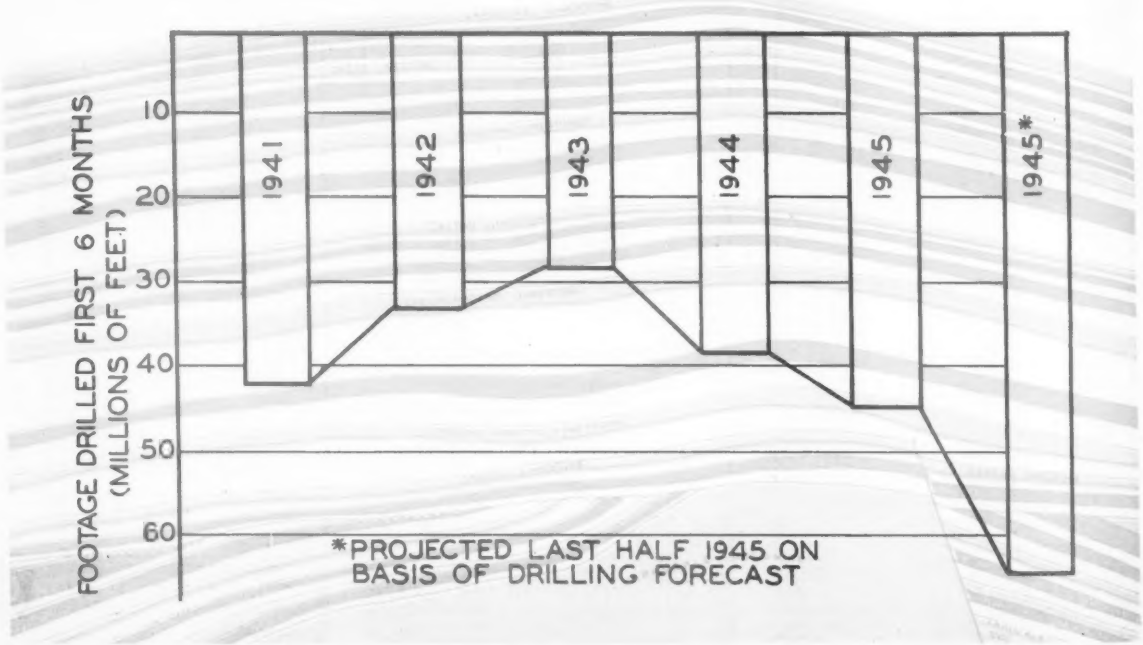
Replies Vary Widely

Individual replies to the Journal's drilling-forecast questionnaire varied widely. One of the largest operating companies in the Southwest, for example, reported plans to drill more than twice as many wells in the second 6 months as it completed in the first half. Several smaller companies reported reductions in anticipated drilling activity of 30 to 50 per cent, although a big majority of operators planning decreased field work replied that activity would hold at 90 to 95 per cent of the first 6 months results. Proposed increases in drilling, however, offset the anticipated declines. An increase of 1,973 well completions indicated during the second 6 months, if accomplished, will raise the final figure for 1945 to 27,595 finalled wells, slightly more than PAW's minimum objective.

Proposed drilling during the second half includes an increase of approximately 500 exploratory wells which will adjust for a moderate deficiency in wildcat drilling during the first 6 months. Footage drilled in the last 6 months, according to replies from the companies and independents accounting for more than 70 per cent of the industry's activity, is expected to total more than 60,000,000 ft., making 1945 the industry's peak year in this respect.

Bulk of Increase for Texas

More than 1,000 of the increased completions anticipated during the second 6 months will be drilled in Texas, representing a gain of 30 per cent in drilling activity for that state. Greater activity will be particularly significant in North Texas, West Texas, East Texas and West Central Texas. Heavier withdrawals from West Texas fields for supplying larger volumes of crude for California refineries in final stages of the Pacific war will stimulate development drilling and enhance exploratory operations, seeking deeper, high-gravity reservoirs. An increase of 379 completions is scheduled in North Texas which will be



DRILLING OUTLOOK FOR LAST HALF OF 1945

	First six months, 1945						Projected operations, second half, 1945						Footage, (thou. feet)	
	Total wells completed						Total wells programmed							
	Rotary	Cable	Drilled deeper	No. of field wells	No. of wildcat wells	No. of service wells	Rotary tools	Cable tools	Drilled deeper	No. of field wells	No. of wildcat wells	No. of service wells	First 6 mos., 1945	Second 6 mos., 1945
Alabama	13	....	....	7	6	0	14	....	....	8	6	0	46	50
Arizona	0	....	....	0	0	0	1	....	....	0	1	0	0	3
Arkansas	80	4	....	60	24	0	96	3	....	82	17	0	391	652
California	1,147	....	67	1,041	106	0	1,088	....	33	930	156	2	4,458	4,995
Colorado	17	....	....	13	4	0	64	....	....	48	16	0	96	387
Florida	9	....	....	1	8	0	15	....	....	2	13	0	62	97
Georgia	3	....	....	0	3	0	4	....	....	0	4	0	9	11
Illinois	740	2	31	555	187	6	852	....	....	642	210	0	1,984	2,018
Indiana	140	....	4	98	42	0	105	....	....	73	32	0	237	289
Iowa	1	....	....	0	1	0	2	....	....	0	2	0	2	4
Kansas	604	202	....	604	202	2	673	224	....	645	252	112	2,681	3,385
Kentucky	161	137	25	253	45	0	175	150	23	270	55	0	685	925
Louisiana	499	....	11	417	82	0	524	....	13	429	95	36	3,825	4,500
North	174	....	3	130	44	0	263	....	3	208	55	0	821	919
South	325	....	8	287	38	0	261	....	10	221	40	36	3,004	4,015
Michigan	212	151	24	241	122	0	268	191	....	304	155	0	938	1,604
Mississippi	184	....	....	120	64	0	251	....	....	166	85	0	1,206	1,894
Missouri	7	....	....	4	3	0	8	....	....	4	4	0	5	6
Montana	142	....	9	125	17	0	243	15	....	229	29	0	352	539
Nebraska	6	....	....	0	6	0	8	....	....	3	5	0	27	34
New Mexico	197	25	....	185	37	0	311	35	....	289	57	0	748	1,482
New York	0	662	....	662	0	330	0	630	....	628	2	300	871	1,400
N. Carolina	0	....	....	0	0	0	1	....	....	0	1	0	0	5
N. Dakota	0	....	....	0	0	0	0	....	....	0	0	0	0	0
Ohio	0	431	....	391	40	0	0	519	....	473	46	0	1,156	1,488
Oklahoma	1,150	122	....	1,034	238	5	1,089	116	....	976	229	39	5,379	4,947
Oregon	0	....	....	0	0	0	1	....	....	0	1	0	0	5
Pennsylvania	0	1,730	53	1,730	0	737	0	1,946	100	1,946	0	850	2,684	3,569
S. Dakota	1	....	....	0	1	0	1	....	....	0	1	0	1	4
Tennessee	1	....	....	0	1	0	1	....	....	0	1	0	4	4
Texas	3,336	215	44	2,762	789	2	4,357	255	30	3,569	1,043	255	16,114	24,093
East	156	....	7	104	52	0	282	....	8	188	94	0	1,045	2,028
North	828	....	4	628	200	2	1,202	5	....	917	290	20	2,079	4,521
South	283	....	....	203	80	0	322	....	....	232	90	12	1,212	1,388
Lower Gulf	400	....	13	318	82	0	480	....	12	382	98	13	2,581	3,431
Southwest	48	....	....	25	23	0	47	1	....	26	22	0	235	236
Upper Gulf	411	....	20	312	99	0	480	....	10	365	115	10	2,944	3,401
Panhandle	247	21	....	264	4	0	372	4	....	356	20	0	859	1,248
West	793	138	....	762	169	0	918	160	....	884	194	200	4,525	6,602
W. Central	170	56	....	146	80	0	254	85	....	219	120	0	634	1,238
Utah	0	....	....	0	0	0	1	....	....	0	1	0	0	3
Virginia	0	....	....	0	0	0	0	....	....	0	0	0	0	0
Washington	2	....	....	0	2	0	3	....	....	0	3	0	8	12
W. Virginia	23	366	62	389	0	0	36	379	47	415	0	0	982	1,052
Wyoming	89	....	3	64	25	0	131	....	4	94	37	0	406	645
Total	8,764	4,047	333	10,756	2,055	1,082	10,321	4,463	250	12,225	2,559	1,594	45,357	60,102

the favored source of supply to supplement natural declines in more northern parts of the Mid-Continent.

The increase of 112 completions during the second half forecast for Illinois reflects the continuing brisk demand for crude supplies adjacent to the Chicago refining area. Operators are justified in drilling marginal properties because of the relatively high rates of withdrawal, affording quick payouts and steady demand for all producible crude.

A significant increase is indicated by the Journal questionnaire in well completions for New Mexico. The state has several newer fields which are just now reflecting attractive productivity. Operating companies report plans to intensify development drilling in these districts and will increase exploration work slightly.

An increase of 276 per cent is indicated for Colorado where operators propose to complete 64 wells during the last 6 months. The new pipe-line outlet from the Rangely field is chiefly responsible for the expected increase.

Montana and Wyoming, the accompanying tabular data disclose, will share with Colorado in the total increase of 190 completions for the Rocky Mountain producing states.

The increase of nearly 25 per cent expected in exploratory-well completions is distributed approximately proportional to the general level of drilling activity. To an expected increase of 504 exploratory-well completions. Texas will contribute 254 which is approximately proportional to its position as a producing state. Considering that the state accounted for more than 30 per cent of the wildcat wells completed during the first 6 months, it is entirely logical to expect an increase of 32 per cent in exploratory completions which is the result shown in the Journal's survey.

One of the factors which will contribute to increased drilling activity during the second 6 months is relaxation of spacing restrictions, thus permitting operators to fill in development patterns, particularly in shallow, unprorated fields. A revised spacing order is to be issued shortly covering several California fields, chiefly for the purpose of sustaining Pacific Coast production at the highest possible level for duration of the war. Other similar modifications to spacing restrictions may be issued in District 3 where operators report a moderate trend to curtail drilling because locations are not available for all existing drilling equipment.

Reports continue that the military services soon will cancel contracts for heavy engines of the type required for equipping new rigs. When facilities are converted to civilian production and the petroleum industry is granted access to those units the drilling and completion rate should respond upward with little delay. Scores of contractors, investigation reveals, are in the market for new rigs, especially those capable of drilling to the greater depths currently required in West Texas, the Gulf Coast and California.

XUM

Industry Expects to Put 7,000 Wells on Pump in Second Half

by H. Stanley Norman

NEARLY 7,000 oil wells will go on pump during the second half of 1945, requiring 5,052 new installations for artificial lifting of crude oil, according to results of the Journal's midyear survey. The current manufacturing rate of pumping units, exceeding 1,000 per month for the first time in June since the war started, must be increased to supply requirements of the industry in sustaining peak production.

Reports to the Journal indicate that 6,915 wells will go on pump in the last 6 months, including wells which formerly flowed their production and new completions requiring artificial lifting equipment in order to contribute their part to the overall supply.

Pump manufacturers, according to the July report of the Materials Division, Petroleum Administration for War, have backlog orders covering 5,929 units. The peak manufacturing rate of 1,015 pumping units in June appears hardly more than adequate to cover new requirements, indicating that the backlog of orders can be liquidated only to a moderate extent during remainder of the year.

Lead time required on pumping unit orders now varies from 6 to 10 months, depending on whether the purchaser requires an installation complete with engine or can supply the power end from inventory or other sources.

There were 5,123 wells put on pump during the first 6 months this year. The percentage of new oil-well completions requiring pumps is higher than in peacetime because many of the relaxed spacing orders have applied to shallow fields, producing marginal volumes per well but contributing importantly either from location of the supply, type of crude or speed with which wells can be completed.

The flowing life of numerous wells has been shortened in many cases by the necessity for exceeding the maximum efficient rate of production in order to meet exigencies of the war. This factor has increased the number of wells brought to the pumping stage, although completions may have occurred earlier in the war or during prewar years.

Prudent operators, the Journal's data show, are equipping wells with pumping facilities in some fields before their wells cease flowing. This precaution is encouraged by PAW and by industry production committees in order to avoid long periods of interrupted productivity which might prevail if operators waited to order pumping equipment until wells stopped flowing. The static price of crude oil and rising production costs have combined to stimulate installation of new pumping equipment. Operators have been forced by economic considerations to install the most efficient lifting equipment procurable in order to justify continued production from marginal properties.

Production executives anticipate that the economic incentives to install the most efficient pumping equipment will become more compelling with end of the war. Consequently, hundreds of installations are being made and planned now for the dual purpose of contributing maximum production at lowest possible cost in meeting war demand for crude and for successful competition with cheaply produced imported oil after Japan is defeated.

An increase of nearly 30 per cent in the number of wells likely to require pumping in Texas during the last 6 months compared to the first half is indicated by the Journal survey. West Texas will lead the other districts with probable requirement for 1,028 units some of which, naturally, will be removed from current service and applied to new completions or to older wells reaching the pumping stage.

The estimated cost of replacing obsolete pumping equipment covers only the units which will be permanently retired from service. Many of the inefficient units displaced by more economical equipment will be retained in service and assigned to less expensive operations. This shuffle of equipment is more prevalent currently than under normal conditions because operators have been compelled for 3 years because of material shortages to compromise in the installation of pumping units. Actual retirements from pumping service, therefore, are limited to the oldest and least efficient units with the process of grading starting at the top and filtering down through the entire structure and then only to the extent that available new units exceed pumping-well completions.

PROBABLE DEMAND FOR PUMPING UNITS

State or district—	Wells put on pump during first half of 1945	Wells likely to go on pump during last half 1945	Units of all types probably needed in second half, 1945 exclusive of used equipment	Estimated replacement cost of obsolete pumping units
Alabama	4	4	4	$ 1,550
Arkansas	14	25	45	9,650
California	498	596	558	230,000
Colorado	8	3	3	1,100
Florida	1	1	0	0
Illinois	362	502	171	194,000
Indiana	87	44	17	17,000
Iowa	0	0	0	0
Kansas	286	360	228	139,000
Kentucky	62	90	34	34,700
Louisiana	83	175	125	67,500
North Louisiana	40	51	36	19,700
South Louisiana	43	124	89	48,000
Michigan	253	383	280	147,800
Mississippi	74	79	51	30,500
Missouri	1	2	2	1,000
Montana	55	21	21	8,000
Nebraska	0	2	2	1,000
New Mexico	128	211	173	81,500
New York	120	120	120	46,000
Ohio	39	71	37	27,500
Oklahoma	382	437	339	168,700
Pennsylvania	239	379	306	146,300
Texas	2,366	3,307	2,462	1,276,200
East Texas	723	753	493	290,600
North Texas	524	796	679	307,200
South Texas	83	107	107	41,300
Lower Gulf Coast	48	69	48	26,600
Southwest Texas	18	54	38	20,800
Upper Gulf Coast	172	276	144	106,500
Panhandle	81	77	77	29,700
West Texas	593	1,028	774	396,800
W. Central Texas	124	147	102	56,700
West Virginia	21	27	8	10,400
Wyoming	40	76	66	29,000
Total	5,123	6,915	5,052	$2,668,400

Well Completions Increase 12.9 Per Cent First Half of 1945

by Charles J. Deegan

RECORD-BREAKING wartime demand for crude, combined with slight improvement in availability of materials, and expanded transportation outlets, resulted in an increase of 12.9 per cent in total well completions during the first half of 1945 compared to the same period in 1944.

Wildcatting, stimulated by a desire to replace the reserves used up by the war demand, increased 17.8 per cent to a record-breaking total of 2,055.

Although registering a slight decline, the eastern area of New York, Pennsylvania, Ohio, and West Virginia still accounted for about one-quarter of the total completions.

Among the major oil-producing states, Texas continued to lead, with 3,551 completions, an increase of 35.6 per cent; Oklahoma jumped from fourth place last year to second this year, an increase of 59 per cent bringing the total to 1,272 completions; California maintained third place with 1,147 completions, an increase of 18.2 per cent. Kansas, with a decrease of 10.1 per cent, and a total of 806 wells, dropped from second place in 1944 to fourth this year; Illinois with 742 completions, maintained fifth place, even though this represented a drop of 9.6 per cent.

The nine major producing states (See Table 1) that were producing 95 per cent of the oil on July 1, 1945, had an increase of 22.2 per cent in completions, the eastern area showed a decrease of 6.5 per cent, and all other states combined had an increase of 15.2 per cent.

Rocky Mountain

Total completions showed a small 4 per cent decrease in the first half, a gain in wildcats being offset by a decline in development wells. This is partly due to a decline in drilling at Elk Basin and Oregon Basin.

In Montana a new pool was opened 2 miles west of Kevin-Sunburst, and there were small discoveries in Toole and Liberty counties. The Wyoming discoveries, with the exception of South Elk Basin, were extensions to last year's important strikes. The Rangely field in Colorado was extended north, west, and southeast, adding perhaps 10,000 acres to the proven area, with the limits still undefined.

Both wildcat and development drilling are expected to show substantial increases in the last half of this year. Development drilling is expected to expand in the black-oil fields of the Big Horn Basin and in Fremont and Carbon counties as a result of pipe-line extensions. Rangely and Wilson Creek in Colorado will have the same stimulus to increased development. Wildcatting on a more extensive scale is anticipated in western and northwestern Colorado, and in the Wind River and Big Horn basins in Wyoming, and in new areas in northern Montana.

Pacific Coast Activity

California's increase of 177 wells represents just about the drilling in the Elk Hills naval reserve where a highly coordinated and intensive program resulted in 169 completions during the first half of 1945. The second most active area was Buena Vista Hills. With naval reserve drilling scheduled for only enough future drilling to maintain production, Buena Vista Hills will probably be the most active area the rest of the year, and scattered drilling in other fields will probably not register as many wells per rig as the intensive program at Elk Hills. Therefore some decrease may be in line for the last half.

Wildcatting resulted in three new California oil pools and two gas fields. The oil finds were Halsey Canyon, La Habra Hills, and Ramona. The gas discoveries were Kirby Hills and North Rio Vista, both in the Sacramento River Delta area in Solano County. Development of Eocene production at Capitan in Santa Barbara County may prove more important in terms of reserves than the three oil discoveries.

Exploration work during the last half of the year will continue to be statewide and maintain its present pace. Definite interest is being dis-

TABLE 1—SUMMARY OF COMPLETED WELLS, FIRST 6 MONTHS, 1945

	Total comp.	Oil	Gas	Dry	Service	Avg. footage	Ttl. Jan.-June, 1944
New York	662	332	0	0	330	1,315	709
Pennsylvania	1,730	868	107	18	737	1,551	1,854
West Virginia	389	36	300	53	0	2,524	418
Ohio	431	97	177	157	0	2,683	456
Indiana	140	51	5	84	0	1,691	130
Illinois	742	455	1	280	6	2,673	821
Kentucky	298	105	82	111	0	2,298	380
Michigan	363	134	20	209	0	2,584	278
Kansas	806	368	65	371	2	3,327	897
Neb., Mo., Iowa	14	1	2	11	0	2,408	3
Oklahoma	1,272	742	118	407	5	4,229	800
Texas	3,551	2,010	336	1,203	2	4,538	2,619
North	828	426	6	394	2	2,510	484
West Central	226	89	24	113	0	2,807	102
West	931	698	9	224	0	4,860	782
Panhandle	268	94	157	17	0	3,204	97
Eastern	156	55	43	58	0	6,697	143
Upper Gulf Coast	411	233	32	146	0	7,163	323
Lower Gulf Coast	400	258	40	102	0	6,453	340
South	283	138	25	120	0	4,284	229
South Central	48	19	0	29	0	4,904	40
Louisiana	499	291	40	168	0	7,666	364
Northern	174	73	33	68	0	4,719	138
Southern	325	218	7	100	0	9,244	226
Arkansas	84	50	0	34	0	4,652	104
Mississippi	184	96	0	88	0	6,557	48
Alabama	13	5	1	7	0	3,551	14
Georgia	3	0	0	3	0	2,903	1
Florida	9	1	0	8	0	6,871	2
Montana	151	101	25	25	0	2,333	182
Wyoming	89	67	2	20	0	4,562	92
Colorado	17	14	0	3	0	5,656	13
New Mexico	222	150	11	61	0	3,370	214
California	1,147	934	25	189	0	3,886	970
Arizona, Oregon	0	0	0	0	0	0	2
Tennessee	1	0	0	1	0	3,707	0
South Dakota	1	0	1	0	0	1,315	0
Washington	2	0	0	2	0	3,470	0
Total 1945	12,820	6,908	1,318	3,512	1,082	3,538	11,356
Total 1944	11,356	5,851	1,359	3,176	970	3,386	....
Difference	1,464	1,057	41	336	112	....	....
Total 1943	8,719	4,369	826	2,673	851	....	....
Total 1942	10,403	5,469	997	2,767	1,170	....	....
Total 1941	14,253	8,650	1,251	3,278	1,074	....	....
Total 1940	15,037	9,879	920	3,117	1,121	....	....

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TABLE 2—WILDCAT COMPLETIONS, FIRST 6 MONTHS, 1945

	Comp.	Oil	Gas	Dry
Ohio	40	0	9	31
Indiana	42	5	1	36
Illinois	187	26	0	161
Kentucky, Western	45	8	0	37
Michigan	122	6	2	114
Kansas	202	19	9	174
Neb., Mo., Iowa	10	0	0	10
Oklahoma	238	48	10	180
Texas	789	117	23	649
North	200	29	1	170
West Central	80	11	4	65
West	169	30	0	139
Panhandle	4	0	0	4
Eastern	52	8	0	44
Upper Gulf Coast	99	16	8	75
Lower Gulf Coast	82	13	4	65
South	80	7	5	68
South Central	23	1	1	21
Louisiana	82	14	4	64
Northern	44	4	4	36
Southern	98	10	0	28
Arkansas	24	0	0	24
Mississippi	64	3	0	61
Alabama	6	0	1	5
Georgia	3	0	0	3
Florida	8	0	0	8
Montana	17	7	0	10
Wyoming	25	8	0	17
Colorado	4	1	0	3
New Mexico	37	5	2	30
California	106	3	2	101
Tennessee	1	0	0	1
South Dakota	1	0	1	0
Washington	2	0	0	2
Total United States	2,055	270	84	1,721
First half 1944	1,745	216	64	1,465

played by major companies in the Washington-Oregon area, and some wildcats will be started in the last half of the year, with others tentatively scheduled for 1946.

Kansas

Total completions fell off about 10 per cent, with wildcatting showing a greater decline than development wells. None of the 17 new oil fields appears to be exceptional. The Ryan pool in Rush County, an April discovery, with six additional producers, had received most development. About 20 percent of the development activity was concentrated in the Kraft-Prusa, Hugoton, Trapp and El Dorado fields. About 25 per cent of the wildcatting was concentrated in Barton, Russell and Stafford counties. Prospects for the last half of the year are for a slight increase both in development and wildcat drilling as compared to the first half.

Oklahoma

An increase of 59 per cent in completions was well divided between development wells and wildcats. Of 238 wildcats, 1 out of 4 found some oil or gas. West Edmond dominated drilling, with 276 completions, followed by Hugoton gas with 32, East Pauls Valley with 37, Cement with 23, and the Ed Cox area of Carter County with 22. These fields included about 40 per cent of all the development wells drilled.

West Edmond spread so far and so fast that eight wells originally classed as wildcats resulted in successful extensions. The hot wildcat play in the southeast end of the Anadarko Basin resulted in 20 wildcat completions in Garvin, McClain, and Grady counties, with 6 oil wells, and 1 gas well resulting. Included were important extensions and a new pay in East Pauls Valley, extensions to Northwest Hoover, and the discovery of the Chitwood, East Antioch, and McGee pools.

Prospects for the last half year are some slowing down as West Edmond drilling falls off, since the trend in the southeast Anadarko Basin play is toward 10,000-ft. tests, too deep for most of the West Edmond rigs.

Southeast New Mexico

Drilling, both development and wildcat, was at about the same rate as in the first half of 1944. Wildcatting resulted in five oil and one gas strike, most of the oil discoveries being extensions. The most important area seems to be around the Drinkard-Yeso (Clear Fork) discovery of 1944, where extensions have been found. The most active field development was at West Lovington, Red Lakes, Square Lake, and Artesia. Prospects for the last half are maintenance of a steady pace, with greatest activity in the Drinkard and West Lovington areas.

West Texas

The effect of increased transportation outlets with accompanying higher allowables from old fields, combined with a desire to increase reserves in an area of promise, resulted in the odd pattern of development wells increasing only 12 per cent while wildcats increased 62 per cent. The increasing promise of pre-Permian testing was partly responsible for this disproportion.

Wildcatting resulted in 10 new fields, 7 new pays, and 13 important extensions. The most important appear to be developments at TXL in Ector County, Devonian prospects in Andrews County, and additional confirmation of the importance of Keystone-Ellenburger where multiple pre-Permian pays have been established.

Drilling was most active at Fullerton, Slaughter, Keystone, North Cowden, and the Howard-Glasscock area. The most active fields in the last half will probably be TXL, Fullerton, Keystone and Midland Farms. Wildcatting, particularly pre-Permian tests, will continue to be heavy throughout the district.

Texas Panhandle

Four dry wildcats in 1945 compared to three failures in 1944 sums up the Panhandle's first-half exploration. Major activity was concentrated on gas development wells, with 157 completions, compared to 1 in the first half of 1944 when restrictions on the use of materials for gas wells were in effect.

North Central Texas

Drilling activity was up about 50 per cent over 1944 with wildcatting exceeding that ratio and development wells falling a little short of it. The discoveries appear to be about the usual run of small fields and new pays, with new Strawn pools in Clay and Jack counties, a Marble Falls pool in Jack County, a Mississippian pay at Farmer-Garvey in Young County, and Bluff Creek in Jones County looking the most promising.

TABLE 3 — DEVELOPMENT WELLS COMPLETED BY STATES, FIRST 6 MONTHS, 1945

	Comp.	Oil	Gas	Dry
New York	662	332	0	*330
Pennsylvania	1,730	868	107	*755
W. Virginia	389	36	300	53
Ohio	391	97	167	126
Indiana	98	48	4	46
Illinois	555	429	1	*125
Kentucky	253	97	82	74
Michigan	241	128	18	95
Kansas	604	349	56	*199
Neb., Mo., Iowa	4	1	2	1
Oklahoma	1,034	694	108	*232
Texas	2,762	1,896	310	*556
North	628	396	5	*227
West Central	146	79	20	48
West	762	669	9	84
Panhandle	264	94	157	13
Eastern	104	50	40	14
Upper Gulf	312	216	23	73
Lower Gulf	318	245	36	37
South	203	131	20	52
So. Central	25	17	0	8
Louisiana	417	277	36	104
Northern	130	69	29	32
Southern	287	208	7	72
Arkansas	60	50	0	10
Mississippi	120	93	0	27
Alabama	7	5	0	2
Georgia	0	0	0	0
Florida	1	1	0	0
Montana	134	94	25	15
Wyoming	64	58	2	4
Colorado	13	13	0	0
New Mexico	185	145	9	31
California	1,041	831	23	87
Total U. S.	10,765	6,841	1,251	*2,673

*Includes input wells.

TABLE 4—COMPARISON OF DRILLING RESULTS, 6 MONTHS 1945 VS. 1944

	6-month total completions		Per cent change	Thous. bbl. oil prod. 7-1-45	Oil well completions		Per cent change	Gas well completions		Per cent change	Dry hole completions		Per cent change
	1945	1944	1945	dly. avg.	1945	1944	1945	1945	1944	1945	1945	1944	1945
Texas	3,551	2,619	+35.6	2,180	2,010	1,641	+22.5	336	92	+265.2	1,205	886	+36.0
California	1,147	970	+18.2	943	934	795	+17.5	25	17	+ 47.1	188	158	+19.0
Louisiana	499	364	+37.1	368	291	204	+42.6	40	18	+122.2	168	142	+18.3
Oklahoma	1,272	800	+59.0	388	742	426	+74.2	118	74	+ 59.5	412	300	+37.3
Kansas	806	897	—10.1	273	368	423	—13.0	65	28	+132.1	373	446	—16.4
Illinois	742	821	— 9.6	213	455	510	—10.8	1	3	— 66.7	286	308	— 7.1
New Mexico	222	214	+ 3.7	104	150	139	+ 7.9	11	9	+ 22.2	61	66	— 7.6
Wyoming	89	92	— 3.3	103	67	79	—15.2	2	1	+100.0	20	12	+66.7
Arkansas	84	104	—19.2	80	50	60	—16.7	0	1	—100.0	34	43	—20.9
Nine-state subtotal	8,412	6,881	+22.2	4,652	5,067	4,277	+18.5	598	243	+146.1	2,747	2,361	+16.3
Eastern (incl. Ohio)	3,212	3,437	— 6.5	66	1,533	1,114	+19.7	584	977	— 40.2	*1,295	*1,346	— 3.8
All other states	1,196	1,038	+15.2	181	508	460	+10.4	136	139	— 2.2	552	439	+25.7
Total United States	12,820	11,356	+12.9	4,899	6,908	5,851	+18.1	1,318	1,359	— 3.0	4,594	4,146	+10.8

*Includes input wells.

Eastern Texas

Completions were up about 10 per cent compared to 1944, but with a shift from wildcatting to development work. Eight successful wildcats resulted, the most important being the first Travis Peak production in Freestone County, a gas-condensate discovery; gas-condensate from the Bacon (Upper Rodessa) in Henderson County, and important extensions to the Carthage gas-condensate field. The greatest development activity was in Carthage, Pickton, New Hope, and Long Lake fields. Carthage will probably dominate the last-half development work while activity will be greatest around the Carthage area and Cherokee and Anderson counties.

Southwest Texas

Total completions showed a substantial increase, with wildcatting falling off, but development work more than doubling. This was due to increased attention to improved prospects at Garcia, Seeligson, Slick-Wilcox, Stratton, Tijerina, Willamar, and others.

Texas Gulf Coast

This area showed an increase of 22 per cent in completions in the first half, with wildcatting at a slightly higher rate and development wells slightly lower. Wildcat results were fairly good, with one out of every four tests finding some kind of production. Total activity was about evenly divided between Upper and Lower Coast areas, with wildcatting more active in the Upper.

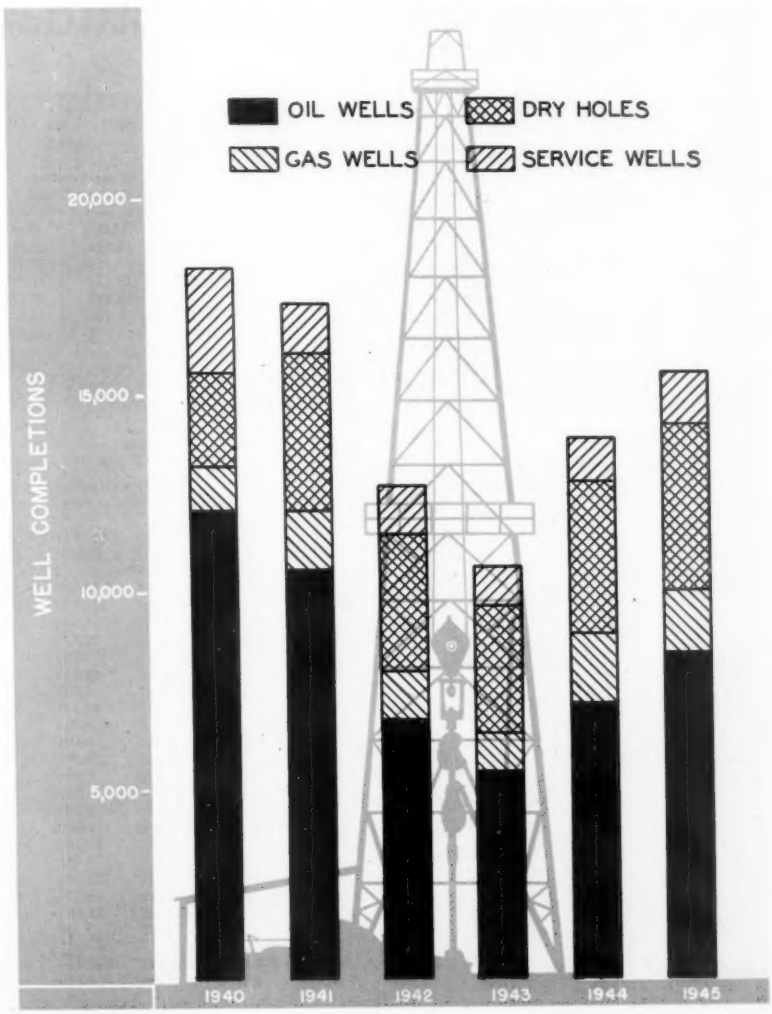
The dry hole ratio in development wells dropped to 17 per cent compared to 22 per cent last year, indicating that on the average, better prospects were being drilled. The greatest drilling activity in proven areas is and will probably continue to be in Blue Lake, Livingston, Fannett, Katy, and Fig Ridge. Exploratory drilling has been most active in Brazoria, Chambers, Harris, Jackson, Matagorda, and Wharton counties.

South Louisiana

An increase of about one third was registered in total completions, all resulting from more development wells. Wildcatting decreased slightly, although results were more favorable than during the same period of 1944, since nine new discoveries and one extension were recorded compared to six last year.

The Week's Island discovery in Iberia Parish (Shell Oil Co., Inc., 1

(Continued on page 129)



Production Increases 56,440,000 Bbl.

by Charles J. Deegan

TOTAL United States crude-oil production for the first half of 1945 was 56,440,000 bbl. greater than for the same period in 1944, an increase of 312,000 bbl. daily, from 4,495,000 bbl. per day to 4,807,000 bbl., or 6.9 per cent. But even this increase was not sufficient to meet the war demands, and crude stocks on June 30, 1945, were 2,217,000 bbl. below the December 31, 1944, level.

Four states showed important increases, three states had substantial decreases. On net balance, these seven states show an increase of 56,541,000 bbl. which is almost the same as the total United States change. Texas, California, Oklahoma, and Wyoming, in that order, accounted for the substantial increases; Illinois, Kansas, and Pennsylvania dropped off. The increases were: Texas 34,187,000 bbl., California 14,823,000 bbl., Oklahoma 7,001,000 bbl., Wyoming 4,853,000 bbl. The decreases were: Illinois 1,769,000 bbl., Kansas 1,267,000 bbl., Pennsylvania 1,187,000 bbl.

Increases in Texas, on net balance, came from West Texas, the Gulf Coast, and East Texas. West Texas production has increased about 50,000 bbl. per day since July 1, 1944, with about half coming during the latter portion of 1944 and the remainder during the first half of 1945. The Gulf Coast area increased production 80,000 bbl. per day since July 1, 1944, of which about 58,000 bbl. was registered during the last half of 1944, and the remaining 22,000 bbl. during the first half of this year.

Texas Gain Concentrated

Twenty-three fields in Texas accounted for 71.9 per cent of the state increase, and 43.5 per cent of the total United States gain. These fields and their production record for the first half of 1945 and 1944 are shown in Table 2.

Increases in California came from development of the Elk Hills Naval Reserve, Buena Vista Hills, and a steady increase in the Santa Maria Valley district.

Oklahoma's increase was almost wholly due to the rapid development of one field, West Edmond, which increased from 15,000 bbl. daily on July 1, 1944, to 76,000 bbl. per day 1 year later.

Big Horn Fields Rise

Wyoming increases came from the fields of the Big Horn Basin area, particularly Elk Basin, Oregon Basin, and Garland, plus some aid from late 1944 discoveries at Big Sand Draw, Crooks Gap, Bailey, and Gebo.

Decreases in Illinois, Kansas, and Pennsylvania were due to failure to develop sufficient new production to offset normal declines in the older fields.

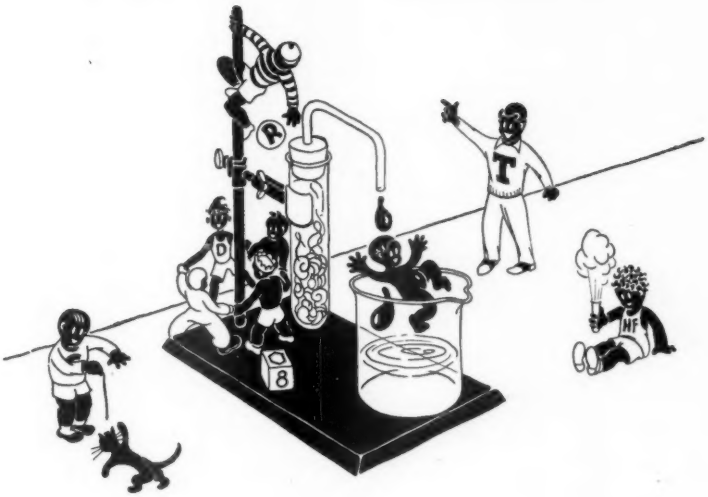
There are two bases on which

TABLE 1—TEXAS CRUDE PRODUCTION — BY DISTRICTS
(Thousands of barrels per month)

	Gulf Coast R.R. Dist. 2, 3 and 4		Eastern Texas R.R. Dist. 5 and 6		West Texas R.R. Dist. 7-C and 8		All other Texas R.R. Dist. 1, 7-B, 9 and 10		Total state	
	1945	1944	1945	1944	1945	1944	1945	1944	1945	1944
January	26,978	24,348	16,371	15,155	14,812	11,471	8,904	7,830	66,255	58,804
February	24,502	22,573	14,918	14,768	13,164	10,746	7,327	7,589	59,911	55,676
March	27,343	24,407	16,334	15,037	15,134	11,026	8,159	7,957	66,970	58,427
April	26,323	24,191	15,409	14,780	14,893	11,855	7,873	7,795	64,498	58,421
May	27,354	25,518	16,070	15,630	15,434	13,633	8,152	8,078	67,010	62,859
June	26,660	24,990	15,864	15,032	15,045	13,671	7,945	7,891	65,314	61,584
6-month total	159,160	146,027	94,766	90,402	88,482	72,202	47,550	47,150	389,958	355,771
Increase	13,133		4,364		16,280		400		34,187	

PRODUCTION IN THE UNITED STATES 1940-44 AND FIRST HALF 1944-45
(In thousands of barrels)

	1940	1941	1942	1943	1944	First 6 mo. 1944	First 6 mo. 1945	Difference	Prod. wells 7-1-45	Dly. avg. bbl. per well	Cumulative prod.
Alabama	.....	.....	.....	.....	43	8	75	+ 67	6	0.7	126
Arkansas	25,755	26,327	26,628	27,600	29,418	14,579	14,505	— 74	3,147	25.5	650,920
California	223,881	230,263	248,326	284,188	311,793	151,032	165,855	+14,823	24,930	36.8	6,851,656
Colorado	1,626	1,875	2,199	2,320	2,944	1,354	1,871	+ 517	212	46.8	79,468
Illinois	147,647	134,138	106,391	82,260	77,413	39,095	37,326	— 1,769	27,602	7.5	1,123,995
Indiana	4,978	6,634	6,743	5,283	5,118	2,559	2,321	— 238	2,329	5.5	149,783
Kansas	66,139	83,261	97,636	106,178	98,762	49,553	48,286	— 1,267	26,501	10.1	1,396,933
Kentucky	5,188	4,762	4,534	7,883	9,621	4,232	5,052	+ 820	14,552	1.9	164,599
Louisiana	103,584	115,908	115,785	123,592	129,207	64,285	63,909	— 376	8,061	43.8	1,617,466
Michigan	19,753	16,361	21,754	20,768	18,490	9,445	8,744	— 701	3,501	13.8	230,805
Mississippi	4,400	15,314	28,833	18,807	16,337	7,667	9,305	+ 1,638	545	94.3	93,470
Montana	6,728	7,526	8,074	7,916	8,627	4,337	4,321	— 16	2,089	11.4	118,529
Nebraska	276	1,636	1,237	635	417	208	157	— 51	71	12.2	4,871
New Mexico	39,129	39,369	31,544	38,896	39,555	20,284	18,890	— 1,394	4,251	24.5	440,432
New York	4,999	5,185	5,421	5,059	4,697	2,363	2,253	— 110	21,953	0.6	150,870
Ohio	3,159	3,340	3,543	3,322	2,937	1,500	1,335	— 165	23,477	0.3	599,638
Oklahoma	156,164	154,759	140,690	123,152	124,616	60,703	67,704	+ 7,001	53,589	7.0	5,398,559
Pennsylvania	17,353	16,750	17,779	15,757	14,118	7,296	6,109	— 1,187	83,260	0.4	1,068,814
Texas	493,209	507,584	483,097	594,343	748,122	355,771	389,958	+34,187	102,554	21.0	9,333,639
West Virginia	3,444	3,433	3,574	3,349	3,070	1,570	1,443	— 127	16,752	0.5	428,315
Wyoming	25,711	29,694	32,812	34,253	32,388	15,667	20,520	+ 4,853	3,973	28.5	653,240
Miscellaneous	91	63	45	52	60	32	41	+ 9	25	9.1	1,316
Total	1,353,214	1,404,182	1,386,645	1,505,613	1,677,753	813,540	869,980	+56,440	423,380	11.3	30,557,444
Daily average	3,697	3,847	3,799	4,125	4,584	4,495	4,807	+ 312	.....	...	.....



Test Tube Baby #9
Isomerization

Isomerization—changing normal paraffins into isoparaffins—was forthcoming as another of the UOP wonder babies. Butane and pentane, straight chain hydrocarbons, are now more valuable as they are changed by isomerization into isobutane and isopentane, branched chain hydrocarbons so necessary to produce aviation gasoline. At present there are thirteen UOP isomerization units in successful commercial operation.

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Compare the cost of Reda's complete modern pump installation with the entire cost of any other.

Prices shown include motor, pump, protector, cable, one starting switch and full string of tubing.

Special surface equipment, sometimes required such as engine-generator, transformer, recording instruments, or automatic controls is not included.

PRICES OF COMPLETE REDA PUMP INSTALLATIONS

For 4½ In. O.D. — 11 Lb. Casing — 4 In. I.D. or Larger

LIFT IN FEET	CAPACITY IN BARRELS PER DAY					
	35	100	200	300	400	500
500	$ 470	$ 570	$ 680	$ 710	$ 760	$ 830
1000	$ 670	$ 790	$ 930	$1020	$1130	$1220
1500	$ 950	$1020	$1230	$1360	$1540	$1740
2000	$1100	$1370	$1520	$1730	$2000	$2190
3000	$1580	$1860	$2160	$2570	$2890	$3100
4000	$2070	$2510	$2860	$3330	$3630	
5000	$2700	$2970	$3430	$4060		
6000	$3170	$3550	$4100			
7000	$3780	$4130	$4700			
8000	$4300	$4990				
9000	$4790					

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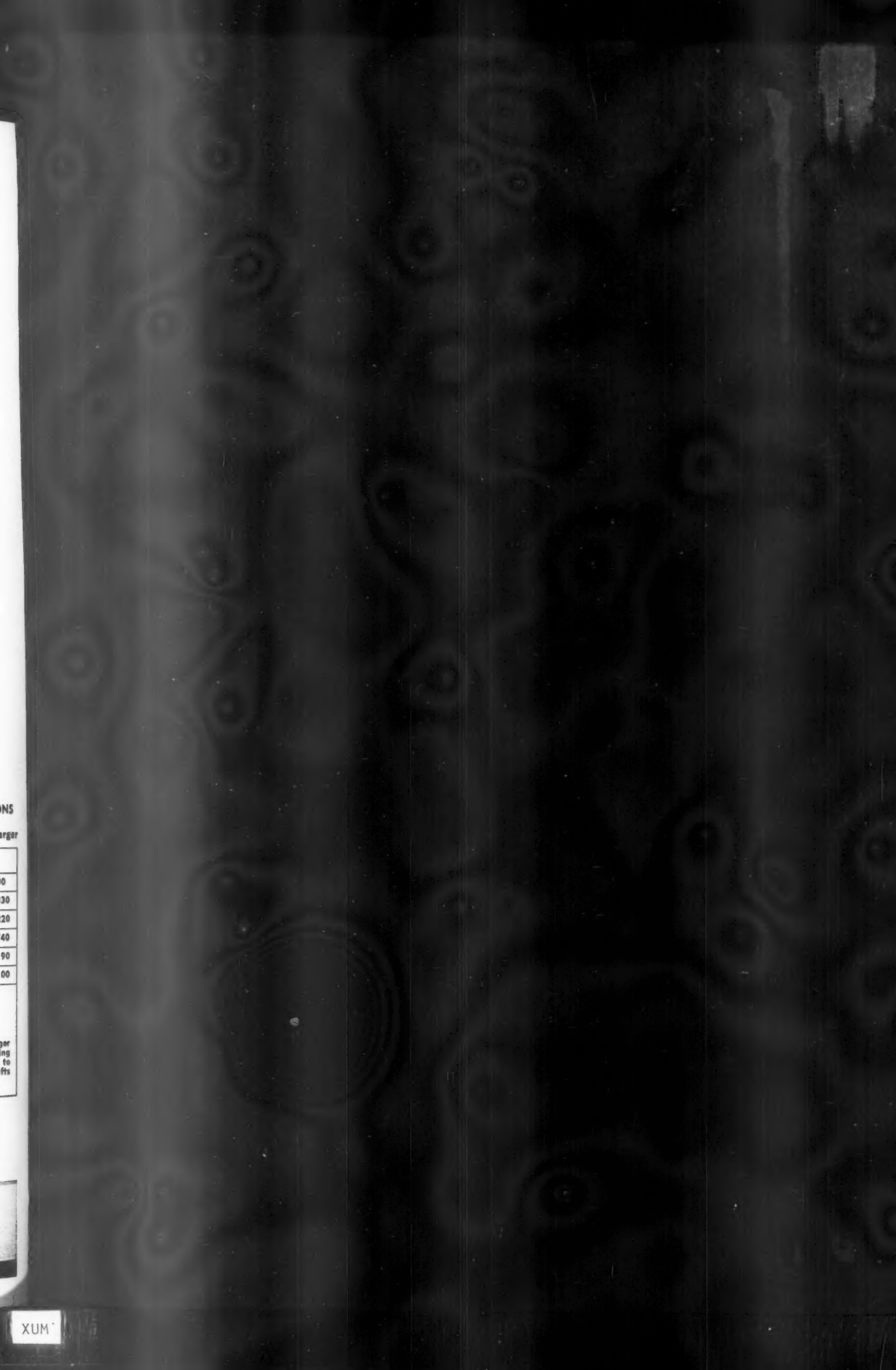

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forecasts of the probable course of production during the last half of 1945 can be projected. One of these is the revised war program, based on developments since V-E Day, and the steady increase in availability of foreign supplies of crude and products, due to progress on the production development and construction programs that have been incorporated in the over-all war plans during the past 2 or 3 years. The other, which will be dealt with first, is on the basis of physical capacity to increase production.

Future Increases Moderate

On the basis of physical capacity to produce, it can be forecast that so long as military demand holds up while material and manpower restrictions continue, the total United States crude production in the last half of 1945 will probably not increase more than 50,000 bbl. daily over the July 1, 1945, level of around 4,900,000 bbl. daily. It may just hold reasonably steady with minor fluctuations around the current level.

There will be some increases in California, if it is physically possible to achieve them without undue waste. Barring unexpected engineering developments as to the maximum efficient rates of important pools, such increases are more apt to be in the 10,000 to 30,000-bbl. daily range than anything higher.

The Rocky Mountain area, with increased pipe-line outlets, and official stress on assistance concerning materials and manpower problems, can probably increase production as much as 10,000 bbl. daily, possibly more during the last half of the year.

Texas, which on the whole is crowding the ceiling of the maximum efficient rates of production in most areas, can, if necessary, produce more oil. The most favorable area for such increases would be West Texas, where transportation facilities are still a limiting factor; particularly affecting effort to move large volumes of crude to California via tank car.

Oklahoma's possibilities in the last half hinge on the allowables at West Edmond. There is little probability of allowables being increased, and if they should be cut, the high development rate in the rest of the state would be hard pressed to overcome this cut and also equalize the normal decline in the older fields.

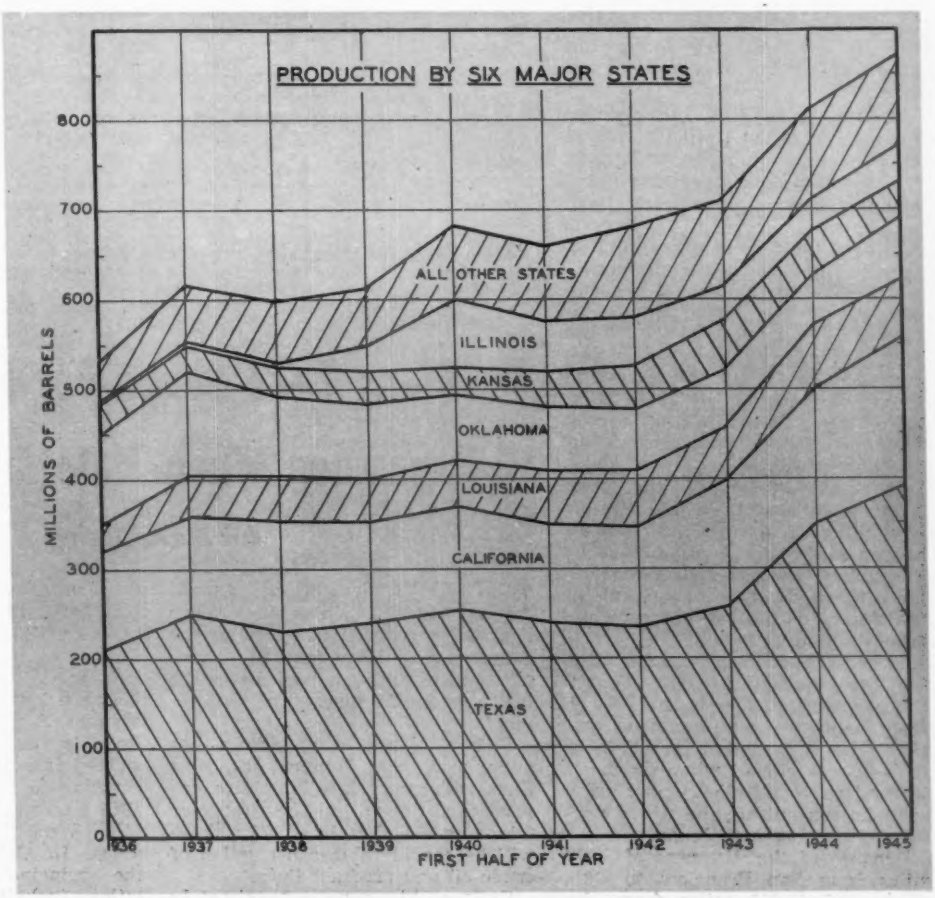
Considering the country as a whole, with present limitations on materials and manpower, a sustained daily average crude production of 4,900,000 to 4,925,000 bbl. for the last half of 1945 will be a substantial physical achievement.

The latest official government pronouncements are that as of this date, estimates of future military requirements are still higher than those made prior to V-E Day. Some oil men question whether a Pacific war will necessarily use as much domestic crude as a two-front war, pointing to official statements classifying the Pacific as a fuel oil and diesel war, in contrast to the gasoline war that was waged in Europe. When fuel oil is the desired product, foreign crudes usually offer a satisfactory source, whereas such substitution is not always practical when aviation gasoline is the desired product.

TABLE 2—TEXAS FIELDS RESPONSIBLE FOR MOST OF PRODUCTION INCREASE, FIRST HALF 1945 VS. FIRST HALF 1944

(Thousands of barrels)

	First half	
	1945	1944
Eastern Texas:		
Van	6,042	5,306
East Texas field	69,398	66,606
West Texas:		
Cowden, North	5,401	3,828
Foster	3,246	2,724
Fullerton	2,840	2,173
Goldsmith	4,415	4,165
McElroy	5,887	4,779
Seminole	4,379	4,018
Slaughter	12,187	9,956
Wasson	12,546	10,205
Yates	6,668	5,293
Gulf Coast:		
Agua Dulce	1,912	1,550
Anahuac	6,195	5,781
Conroe	11,479	11,575
Hastings	11,544	10,801
Old Ocean	3,066	2,680
Seeligson	5,241	2,917
Stowell	3,559	2,147
Thompson	6,946	6,566
Tom O'Connor	10,451	8,065
Webster	10,970	9,952
White Point, East	2,490	2,122
Willamar	1,308	363
Total	208,170	183,592
Increase	24,578	
Per cent of total Texas increase	71.9	
Per cent of total U. S. increase	43.5	



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Refinery Runs to Continue at Unprecedented Peak Levels

A CONSTANT rate of refinery operations at approximately 4,890,000 bbl. daily is expected to prevail through the middle of 1946, according to the long-range report of the Petroleum Industry War Council committee on economics.

This forecast by the PIWC subcommittee summarizes briefly the recent changes in refinery operations and points to the objectives which manufacturers are expected to achieve during remainder of the war. The operating level of 4,890,000 bbl. of daily crude oil runs to stills currently prevailing and expected to continue for a minimum of 11 months compared with average throughput of 4,551,000 bbl. daily in 1944 and 3,917,000 bbl. in 1943.

"Principal problems", the committee reported last week, "will apparently relate to Navy diesel and Navy special fuel oil, inasmuch as shortages of these products are anticipated. Kerosene also will be short, due in part to the projected demands for jet propulsion fuel. A shift in the yields of military and civilian grades of gasoline appears to be necessary."

Maximum supplies of petroleum products from the United States, reduction of inventories in this country to minimum operating levels and engagement of refining facilities outside this country leaves an indicated shortage of many products required by the United Nations.

A deficiency of 129,000 bbl. per day during the fourth quarter of 1945 with an increase to 154,000 bbl. daily in the first quarter next year and receding to 116,000 bbl. during the second quarter of 1946. These deficiencies are expected to be most acute in distillate and residual fuel oils and kerosene.

Increased output of the short products in Caribbean and Persian Gulf refining facilities has been arranged and will be stimulated by the United Nation's petroleum-supply officials in order to prevent interruption of the war program and rehabilitation projects.

Peak production of aviation gasoline was reached by domestic refineries during March and April. The change in manufacturing emphasis from aviation gasoline to fuel oil was abrupt when Germany surrendered and the opportunity arose to concentrate the Allied military forces against Japan.

Because of the distances of 6,900 miles from San Francisco to Okinawa and 11,000 miles from the Gulf Coast to the Philippines it requires an average of 21,000 bbl. of fuel oil to deliver 100,000 bbl. of gasoline from the Gulf Coast to the Pacific military theater. Delivery of the same volume of aviation gasoline from the Gulf Coast to the European theater required an average of 8,000 bbl. of fuel oil. These base figures do not include the fuel oil needed to return dry cargo boats delivering other types of military supplies to the Pacific bases, but they do illustrate forcefully the reasons for current emphasis on production of fuel oil and why the refining end of the industry must swing hard toward maximum output of marine fuels.

Midyear found the refining end of the industry in relatively satisfactory condition. Virtually all major plant construction and additions needed for military products have been completed. Plant operators, therefore, are turning much of their engineering and design talent to the neglected work of rehabilitating and rejuvenating existing facilities, preparing for the postwar period.

Some Facilities Converted

Some facilities have been released from the inefficient service of producing codimer and other special components for aviation gasoline and these units are being converted to production of civilian products. The need for maximum volume production of aviation gasoline, because of the amphibious character of the Japanese war, has diminished and emphasis is currently focused on quality of military flying fuels. The demand for aviation gasoline is expected to continue around 500,000 bbl. daily for duration of the Japanese war but this will present no special problems.

PIWC FORECAST OF CRUDE-OIL RUNS TO STILLS
(Thousands barrels daily)

	1943 Avg.	1944 Avg.	1945 by Quarters First	Second	Third	Fourth	Year	1946 by Quarters First	Second
District 1	633	802	825	840	845	845	839	845	845
District 2	1,117	1,180	1,215	1,220	1,225	1,225	1,221	1,225	1,225
District 3	1,358	1,662	1,734	1,730	1,730	1,730	1,731	1,730	1,730
District 4	86	101	116	122	144	150	133	152	150
District 5	723	806	849	902	940	940	908	940	940
U. S.	3,917	4,551	4,739	4,814	4,884	4,890	4,832	4,892	4,890

PIWC PROJECTION OF TOTAL DEMAND BY DISTRICTS
(Thousands barrels daily)

	1942 Avg.	1943 Avg.	1944 Avg.	1945 by Quarters First	Second	Third	Fourth	1946 by Quarters First	Second
District 1	1,375	1,439	1,765	2,035	1,830	1,631	1,824	1,926	1,651
District 2	1,280	1,250	1,267	1,319	1,303	1,381	1,358	1,352	1,352
District 3	760	760	875	852	891	1,033	1,079	1,107	1,204
District 4	92	94	105	93	113	130	127	123	131
District 5	756	912	1,001	1,166	1,218	1,203	1,201	1,213	1,207
U. S.	4,263	4,455	5,013	5,465	5,355	5,378	5,589	5,721	5,555

Plans Take Shape For Pipe-Line Expansion When Materials Permit

by Paul Reed

EXTENSIVE plans are being made for projects which have been delayed by restrictions following the completion of large crude-oil, products and natural-gas projects in the last 3 years to meet war requirements.

Federal Power Commission has announced that natural-gas pipe lines will spend $160,898,000 to expand facilities within the first year following V-E Day. In addition there will be considerable construction of crude-oil and products lines.

So far this year approximately 2,400 miles of line have either been laid, are now under construction, or are scheduled to be started within the next few weeks. Most of this 1945 work is fairly evenly divided between crude-oil and natural-gas systems. A majority of the products lines completed this year were started last year.

Crude-oil pipe-line activity in 1945 is mostly to serve Rocky Mountain, West Texas and Mississippi areas. In Colorado and Wyoming the principal projects total 305 miles, including Sinclair Refining

Co.'s Sand Draw-Lost Soldier, 67 miles of 8-in.; Utah Oil Refining Co.'s Rangely-Wamsutter, 150 miles of 10-in.; Uintah-Salt Lake City, 25 miles of 8-in. looping; and Stanolind Pipe Line Co.'s Wind River project, 63 miles of 8-in., 10-in. and 12-in. West Texas outlets have been increased by Gulf Refining Co.'s Keystone-Midland, 63 miles of 8-in., and Texas Pipe Line Co.'s 30 miles of 12-in. loops. In Mississippi, Interstate Oil Pipe Line Co. is building a system to Baton Rouge, consisting of 121 miles of 8-in., 10-in. and 12-in.

In addition to these, the largest looping project of the year is that of Texas Empire Pipe Line Co. for laying 164 miles of 12-in. to fill in loop gaps between Sheldon, Mo., and Heyworth, Ill.

The two largest natural-gas programs are concerned with enlarging the capacity of two systems supplying northern industrial centers.

United Gas Pipe Line Co. has recently been authorized by FPC to build the 143-mile 24-in. line from Carthage, Tex., to Monroe, La., costing $7,261,000 which will have capacity for delivering 114,000,000 cu. ft. to Tennessee Gas & Transmission Co. and 65,000,000 cu. ft. to other connections. For increasing transmission facilities, the Tennessee company has been granted a limited certificate by FPC to build four compressor stations having a total of 33,600 hp. New laterals have been built from the Tennessee system to serve important industrial centers.

Panhandle Eastern Pipe Line Co. is spending $8,325,000 to install compressors in a program to raise maximum pressures from 500 to 600 lb. so that an additional 50,000,000 cu. ft. daily may be transmitted. Included in the project is the building of a 32-mile 24-in. line in the Muncie, Ind.-Maumee, Ohio, area.

Future projects being discussed include the following: American Light & Traction Co. plans for spending $70,000,000 for a large diameter line to transmit natural gas from the Hugoton field of Kansas and Oklahoma to Wisconsin and Detroit which will be operated by a new company, the stock of which will be held by Michigan Consolidated Gas Co., Milwaukee Gas Light Co. and Madison Gas Co., subsidiaries of American Light & Traction.

Metropolitan Eastern Corp. has applied for a permit to build an 825-mile 18-in. line from the Carthage field to Ohio. Pacific Lighting Corp. and Pacific Gas & Electric Co. have been developing plans for a Hugoton-Los Angeles line of 1,000 miles. Southern Natural Gas Co. has recently applied for permission to spend $3,771,000 to enlarge its system.

The project of Pacific War Emergency Pipe Line, Inc., for a 900-mile crude-oil line from West Texas to California has been submitted to a committee of Petroleum Administration for War for a consideration of its need as a war measure.

In addition to work in the United States, projects of Arabian American Oil Co., Iraq Petroleum Co. and possible lines to be built in South America when conditions become favorable total more than 2,000 miles.

Well Completions Increase First Half of 1945

(Continued from page 123)

Smith-State, 13-14s-6e, at 13,520 ft.) established a new world record for deep production and opened a new field. The other discoveries were Bayou Mallet, Houma (Barrowtown), Iota, North Delta Farms, Oretta, Reserve, South Elton, West Pine Grove, and an extension at Shuteston. The most active drilling has been in Delta Farms, Erath, Good Hope, Neale, West Tepetate.

North Louisiana-Arkansas

Wildcatting increased 13 per cent compared to only 5 per cent increase in development completions. Arkansas had no discoveries, but North Louisiana had new fields at Sailes, an unnamed Pettit lime discovery in Webster Parish, a new oil pay in the Blanchard gas field, and a new condensate pay at Lake St. John.

Major development activity was at Stephens and Fouke in Arkansas, and at Delhi, Holly Ridge, Monroe gas, and in the old Caddo and Bellevue areas of Louisiana. Developments at Delhi, a late 1944 discovery, confirmed the importance of this as opening a new region around the greater Monroe Uplift for exploration for pinchouts.

Mississippi, Alabama and Florida

Mississippi, reflecting the increasing development activity around 1944 discoveries, had almost four times as many total completions in the first half of 1945 as in the same period last year. An extremely widespread wildcat campaign has been going on, the 64 tests completed in 1945 being located in 32 counties, with only Jones, Rankin, and Warren counties having more than 3 of these. There were 23 counties in which only one or two wildcats were completed. Results so far have been only mediocre, three discoveries being registered, Hub, Langsdale, and Soso. Development wells, totaling 120, were six times greater than in the previous year, with Heidelberg (East and West), Eucutta, Cranfield, Baxterville, Langsdale, and Mallalieu accounting for all but a few of the total.

In Alabama, five producers and two dry holes were drilled in the Gilbertown field. Of six wildcats completed, one opened the Falls City gas field, the others were dry. In June, Florida got its second oil well, a pumper in the Sunniland field. Meanwhile eight dry wildcats were completed. Georgia had three dry wildcat completions.

Illinois

An over-all decrease of 10 per cent in completions was the net result of a 17 per cent increase in wildcatting and a 16 per cent decrease in development wells. Wildcatting results were fairly good, one out of every seven getting oil, and opening 10 new pools and numerous extensions and new pays. None of the new discoveries appeared likely to be big.

Eastern Area

The eastern area, including Ohio, West Virginia, Pennsylvania, and New York, accounted for about one quarter of the total U. S. completions in the first half of 1945, or 3,212 wells. This represents a decrease of about 6 per cent in total from last year. The decrease was general, the Kane to Butler area of Pennsylvania being the only exception. The Bradford-Allegany secondary recovery activity accounted for 1,695 completions, a decrease of 217 from 1944.

Drilling prospects for the last half indicate that the Bradford-Allegany area will continue to fall below 1944; Kane to Butler is expected to maintain its increase, and in Ohio a fair increase over the first half is anticipated as drilling is picking up after a slow start.

Oriskany and Clinton gas discoveries in Ohio have been fairly encouraging. Gas development is most active in the southern part of the Sandyville field, and the northern part of the Ashland-Lorain-Medina field. Brush Creek and Clayton are the most active oil pools with activity increasing in the Corning grade pools in the Newark-Mt. Vernon area.

Canada

Wildcatting activity has been fairly heavy in the plains area of Alberta, less pronounced in the foothills belt. Best results have been obtained in the Conrad field of southern Alberta and the Princess-Steveville area farther north. Conrad, opened in 1944, now has 11 producers. The Princess-Steveville area, opened with a Devonian discovery, has recently developed production in the Madison (Mississippian) some 6 miles south of the original discovery.

XUM

Navajo Plant Yields Large Amounts Of War-Needed Helium

by Arch L. Foster

A NEW MEXICO natural gas that will not burn and yields nearly 8 per cent helium, has given the U. S. Bureau of Mines, and therefore the United States military forces, its largest source of high-concentration helium. This gas was discovered by Continental Oil Co.'s drilling force in northwestern New Mexico, Continental's 1 Navajo well in Rattlesnake field in the Navajo Indian Reservation, while drilling at a depth of approximately 7,000 ft. Its composition is seen from the data in Table 1.

TABLE 1—COMPOSITION OF RATTLESNAKE NATURAL GAS

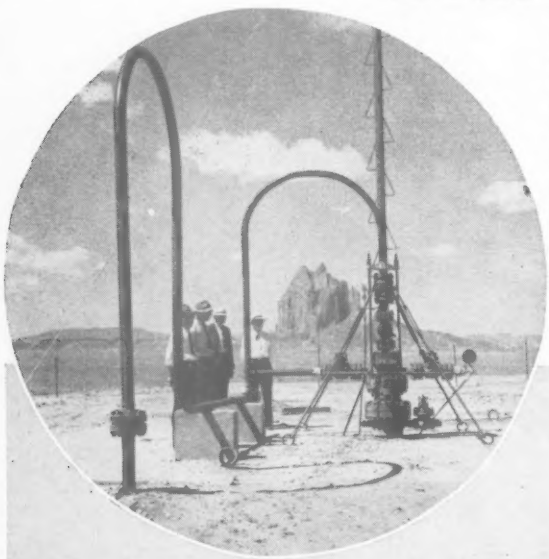
	Per cent
CO_2	2.8
O_2	0.0
CH_4	14.2
C_2H_6+	2.8
N_2	72.6
Helium	7.6
Total	100.0

C. W. SEIBEL

W. M. DEATON

C. W. Seibel, supervising engineer, U. S. Bureau of Mines helium plants, born in Kansas City, Mo., was educated there and at University of Kansas, where he graduated in 1913. His life's work was dedicated by his taking graduate work under Dr. H. P. Cady, who was one of the codiscoverers of helium as a constituent of some American natural gases. Seibel joined the Bureau of Mines during World War I, was assigned to the experimental helium investigations project and has been in that division ever since. He has supervised the design and construction of several helium plants for the Army and Navy, was co-designer of the Amarillo plant. He and his staff have had charge of building four new helium plants during World War II.

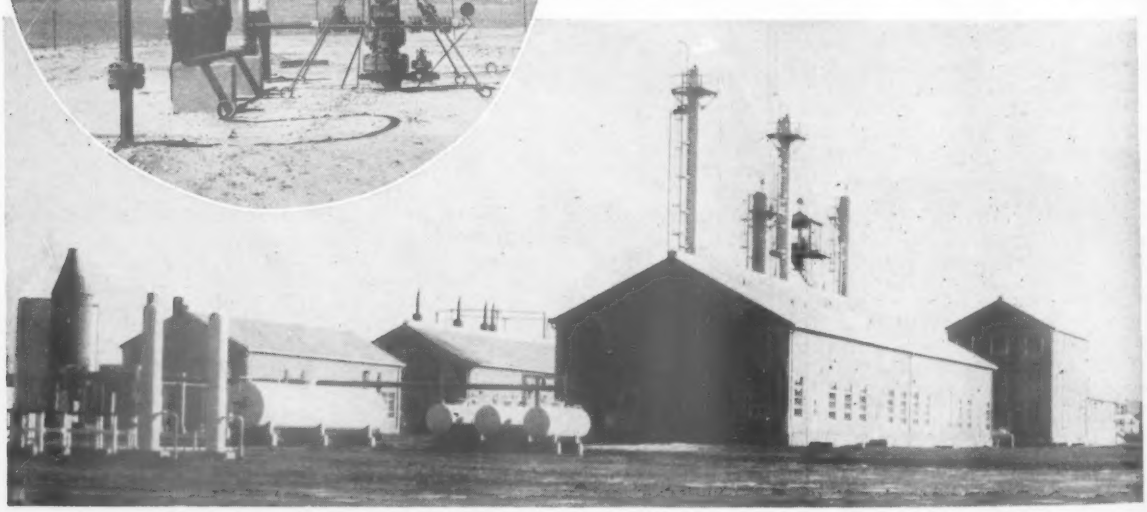
William M. Deaton, helium engineer, U. S. Bureau of Mines, had his education at University of Missouri interrupted by World War I, in which he served 2 years as lieutenant of field artillery. Graduating in 1921, he joined the Bureau of Mines, tackled the helium field, and has been so occupied since, except for 1 year. His time has been spent in helium experimental work, low-temperature research, and in helium production on a large scale. He was bureau engineer-in-charge in the construction of the Navajo plant.



Left: High-helium-content gas well at Shiprock. (Note "shiprock" in background). In the picture are, right to left: H. S. Kennedy, B. of M. Washington office; W. M. Deaton, engineer in charge, Navajo helium plant; W. G. Jackson, petroleum engineer of the plant, and E. J. Hedlund, Department of Interior.

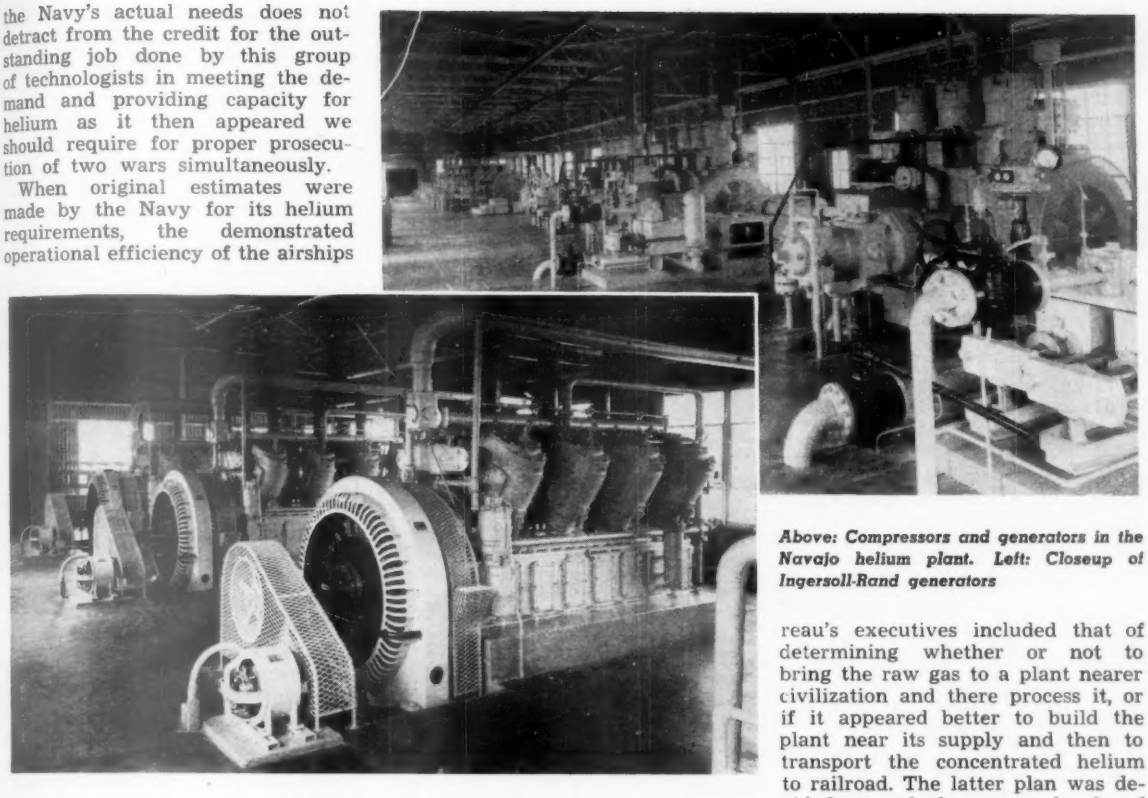
With the outbreak of war, the U. S. Navy developed an estimate of its requirements. The results indicated that on the basis of certain experiences and certain assumptions the output of the B. of M.'s helium division must be increased largely and immediately if the naval requirements for helium were to be met satisfactorily. The fact that later history has shown that this additional supply was in excess of

Below: General view of the plant



the Navy's actual needs does not detract from the credit for the outstanding job done by this group of technologists in meeting the demand and providing capacity for helium as it then appeared we should require for proper prosecution of two wars simultaneously.

When original estimates were made by the Navy for its helium requirements, the demonstrated operational efficiency of the airships and the low leakage loss of helium through the envelopes could not be anticipated safely. Now that they have been realized, the B. & M. has excess production capacity and is making it available to commercial concerns.



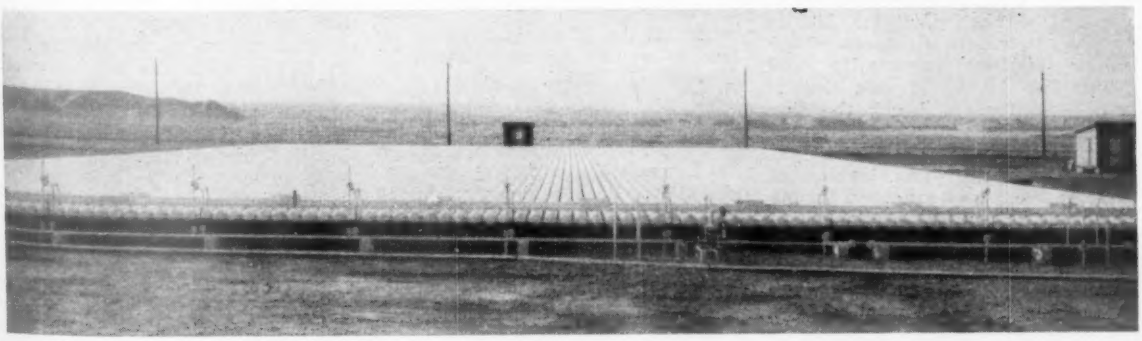
Above: Compressors and generators in the Navajo helium plant. Left: Closeup of Ingersoll-Rand generators

Location of Plant

Noting when it was brought in that the gas would not burn, Continental's men, at the suggestion of the U. S. Geological Survey, sent a sample of it to the bureau's helium headquarters at Amarillo for analysis. The staff there was most agreeably surprised to discover nearly 8 per cent of the valuable, light, and very inert gas in the sample. The Exell plant in the Texas Panhandle is operating on gas which shows less than 1 per cent (0.9 per cent) of helium which is considered about the lowest workable concentration for practical purposes. The new deposit is not accompanied by any great amounts of hydrocarbons, but is a decidedly dry gas, although a small amount of distillate is produced with it. The Rattlesnake field is located near the small village of Shiprock, on the Navajo Indian Reservation in Northwest New Mexico and some 93 miles north of Gallup, near the New Mexico-Arizona line. It is wild, rough, primitive country belonging to the Navajo Indian tribe by grant of the national Government, and that tribe receives for its general tribal funds royalty on all gas, oil, etc., produced within its reservation's boundaries.

The problem faced by the bureau's executives included that of determining whether or not to bring the raw gas to a plant nearer civilization and there process it, or if it appeared better to build the plant near its supply and then to transport the concentrated helium to railroad. The latter plan was decided on and plans were developed and drawn for a complete, self-contained community which must supply all its civilized needs and services as well as the requirements for the plant and its operation.

A site for the plant was selected and permit to use it was given the federal Government by vote of the Navajo Tribal Council. It is located some 8 miles northeast of the wells producing the helium-containing gas. A 4-in. extra-heavy line was laid from the wells to the plant site. The name of the area is taken from a peculiar rock, an igneous extrusion called the Shiprock, due to its fancied resemblance to a schooner-rigged windjammer sailing in this sea of sand, soil, and stone. The gas pressure at the well head is approximately 3,000 psi., and gas



Helium-storage battery, showing method of using large number of long, small-diameter drums

XUM

reaches the plant with only small reduction of this pressure.

The Plant

The various units and subdivisions of the plant and its accessory installations include the stripping unit which removes the recoverable hydrocarbons from the raw gas and recovers these products for required disposal; the carbon dioxide removal and dehydrating processes; helium-concentration and purification equipment, including refrigeration-compression units, heat exchangers; coolers and tanks and receptacles for handling liquefied components of the gas. Gas holders are floated on the lines wherever desirable to provide operating surge capacity. A water-gathering system and pump pit is sunk in the sands of the San Juan River, nearby, to a depth of 15 ft. or more below the river sand level; a settling basin, filter, and zeolite treating units are installed to supply the plant's requirements. The river water filters through many feet of sand before reaching the pump pit, making a natural clarifying filter.

Because all facilities of every kind must be provided, both for the plant and for the convenience of personnel living there to operate this plant, a small "town" was built, made up of five and six-room houses, 54 in number, laid out in rectangular arrangement with streets, adjoining the plant. These houses are supplied with electricity, gas, water, and sewage-disposal facilities. Arrangements for garden plots for each family domiciled there are also made. A laundry building is provided for the use of the families, and a recreation hall or community-center building is also included.

Pipe Lines

In addition to the 8-mile 4-in. extra-heavy line from the well to the plant, it was necessary to obtain fuel gas from an outside source since the helium-containing gas will not burn. A 30-mile long, 4-in. line of used pipe was laid to the northeast which connects to a regular gas line of Southern Union Gas Co. and through this line fuel is brought to supply all needs of the rather isolated community and plant. The laying of this line is a decided feat in itself; the line crosses extremely rocky, rugged terrain, digging of a trench was extremely difficult and explosives were resorted to frequently. In one case, several miles of line were sidetracked around an area too rough to make traversing it practicable.

To handle the helium gas after its purification, a 2-in. Schedule 80 line was laid from the plant at Shiprock to railroad 90.13 miles away at the loading dock alongside the Santa Fe Railroad at Gallup. Unique details of its construction and arrangements will be discussed later.

Main Plant Units

The hydrocarbon-recovery unit at the plant is a more or less conventional natural-gasoline absorption plant. A gas scrubber of conventional design is provided suitable for a working pressure of 3,000 psi.; the absorber tower, designed also for 3,000 psi. working pressure, is 23¼-in. o.d. by 56 ft. high, packed with ceramic Raschig rings. This and other towers used at high pressures are of laminated A. O. Smith construction with 2⅝-in. walls. The hydrocarbons absorbed in the mineral seal absorber oil are recovered in a conventional (36-in. o.d. by 43½-ft. high) still. The stripped gas is treated in a 23¼-in. i.d. by 56-ft. high Raschig-ring-packed contactor with monoethanolamine for removal of carbon dioxide. The CO_2-laden amine solution is regenerated in a typical (30-in. o.d. by 51½-ft. high) stripper. Two parallel (3,000 psi. w.p.) dehydrating columns are provided. Each of these dehydrators is 23¼-in. i.d. by 16 ft. 10-in. high and is filled with solid type (Florite, an activated bauxite) desiccant. The extremely low temperatures employed (—300° F.) in the helium-purification system require the gas to be stripped as completely free as possible of both water vapor and carbon dioxide since, under conditions of operation, either contaminant will solidify and plug lines, valves, orifices, etc., stopping the process.

The helium-separation unit includes heat exchangers for cooling down the stripped, dehydrated, CO_2-free gas; compressors for compressing nitrogen taken from the gas, which is used in liquid form as the final refrigerant in the system; expansion engines; expansion valves; storage and run-down tankage, and other auxiliary units. One 400-hp. and two 300-hp. Clark compressors are used; also four Chicago Pneumatic four-stage compressors. Much of the design and operation of this stage of the plant is covered by secrecy regulations and cannot be discussed in detail.

Electric power and lighting demands are provided for by means of three 250-kw. alternators, driven by Ingersoll-Rand 8-PVG gas engines. Two horizontal-piston pumps operating at 2,000 psi. discharge pump lean oil to the absorber.

On the fuel-gas line the meter is placed in the offtake line immediately after it leaves the main gas line, so that the reading of the meter at this point determines the amounts of gas paid for by the plant, the possibility of gas loss by leakage or other cause being assumed by the Government after the gas leaves the main line.

The 2-in. extra-heavy Schedule 30 helium line from the plant to the railroad dock at Gallup is pressure welded throughout. Because of the peculiar type of climate in this semiarid to arid country, many of the small drain creeks and streams have narrow beds with practically perpendicular sides. A large part of the year these beds are powder dry; when rains fill them with water they become essentially small or large freshets. At such places, therefore, to avoid damage to the helium line, instead of using understream crossings, the line is lifted and "bridged" across them 4 or more feet above ground level, which prevents damage or breakage of the line during periods of high water.

At 5-mile intervals specially designed check valves are installed in this line to reduce to a minimum the loss of $10-per-1,000-cu.-ft. helium in case of a line break. These checks are so designed that they are operated by pressure differential across an orifice, placed in the line. A yoke or U-shaped arrangement extending across this orifice as a bypass is filled with mercury extending up into a box or well which forms part of the line on each side of the orifice. On the surface of the mercury in each box, a round ball valve floats while a seat fitting this ball is placed in the end of the line in the upper part of the box. When a break in the line occurs, the resulting greatly increased flow causes a large pressure differential across the orifice which forces the mercury level down in the leg of the U on the high-pressure side, and correspondingly up on the other side; that is, the low-pressure side of the orifice. The rising mercury raises the ball valve until it reaches the valve seat, closing the line, preventing further outflow of gas until the line is mended. This design of valve was devised by Carl E. Baird, mechanical engineer of the Helium Division.

To simplify communications and maintain close control of all operations, short wave radio transmitters and receivers are placed at the plant at Shiprock and at the loading dock at Gallup with the necessary antenna masts. Two-way instruments are also provided on trucks or cars which may be repairing or inspecting the line at intermediate points so that all may be in direct, instantaneous communication at any time. In an area where for mile on mile neither human habitation nor human may be seen, simple and quick communication is extremely necessary to proper management of this plant. Radio also eliminates the upkeep necessary for a telephone line and is more convenient and

rapid for contact with intermediate points.

Two types of storage are provided for the helium; that for the impure or raw helium, and that for the purified product which is ready for shipment. The raw product is stored in atmospheric - pressure gas holders. The finished-product storage at the plant consists of 120 cylinders, each 10¾ in. diameter and 280 ft. long, arranged horizontally and resting on concrete piers. These cylinders are grouped in tens with a common header and the headers are in turn connected to a second header. The total capacity of this bank is approximately 2,000,000 cu. ft. A bank of 60 cylinders, similarly arranged, is provided at the Gallup station, making possible the storage of 3,000,000 cu. ft. of pure helium at one time. Even this tremendous amount of the very expensive gas is not excessive or even adequate when we consider the amount required to fill one of the Zeppelin-type dirigibles not now in use (6,000,000 cu. ft.).

Operation of Plant

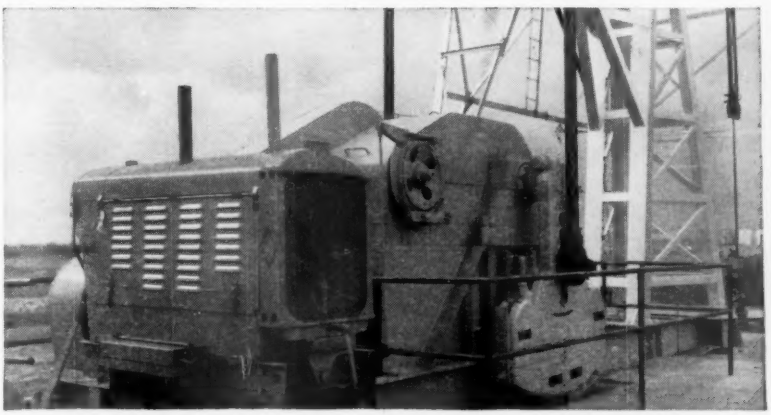
The main operations of the plant begin with the admission of raw gas to the 8-mile line leading to the plant. This gas enters a scrubber drum at the plant at a reduced pressure of essentially 2,000 psi. The gas is available at 3,000 psi. as stated above, but lack of knowledge and first-hand data on gasoline-plant operation at the higher pressures necessitates reduction of the pressure to a figure within the limits of proved experience. After being scrubbed of any distillate it may contain, the gas enters the absorber tower countercurrent to the downflowing absorption oil which removes the propane and heavier. The fat oil passes to the still after being preheated by outflowing lean oil and the absorbed hydrocarbons are distilled off. The lean oil is heated in a Petro-Chem-type cylindrical furnace, and one stream preheats the incoming fat oil, is cooled and recycled to the absorber, and the other stream provides process heat for regeneration of the CO_2 absorbent.

The stripped gas, containing water vapor, carbon dioxide of about 3 per cent or more, and helium and nitrogen then passes through a packed tower countercurrent to a solution of monoethanolamine and ethylene glycol which absorbs essentially all the CO_2 present. Glycol is used with amine solution to decrease the load on the dehydrators. The CO_2-laden amine solution enters the regenerator tower in which it is heated and the carbon dioxide driven off. The regenerated absorbent is cooled and recycled to the CO_2 absorber. From this unit, the gas enters the dehydrators where the gas passes through one column at a time, while the other is regenerating. The desiccant, activated bauxite, is regenerated by passing a stream of hot dry gas through it.

The gas, now being essentially a mixture of helium and nitrogen, is ready to be processed for the recovery of its helium.

The separation of helium from the gas is effected by means of a process developed and perfected by the Bureau of Mines. The equipment is designed, fabricated to a large extent, erected and operated by B. of M. personnel. In view of current secrecy orders, it must suffice to point out that practically all items of equipment must be made of bronze, brass, or copper, which metals and alloys remain ductile at the extremely low temperatures developed in the process.

The pretreated gas is then passed in heat—or rather cold—exchange with previously liquefied gas and finally with liquefied nitrogen. The helium-containing gas is not compressed following its entry into the low temperature cycle, avoiding the necessity for lubricating compressor pistons or of operating them at the extremely low temperatures used (— 300° F.). The exchangers, coolers, expansion units, headers, tubes, etc., used in this part of the process are entirely of bronze, brass, and copper.



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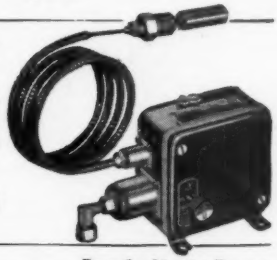

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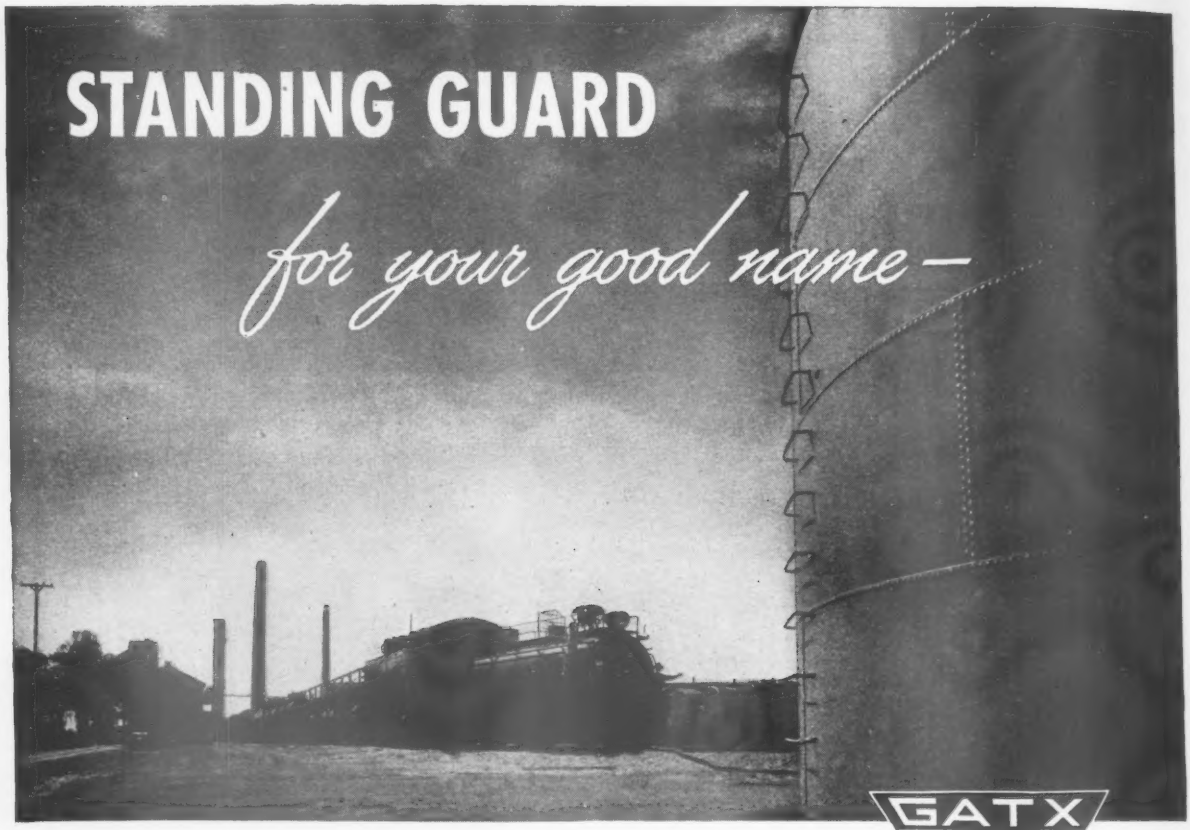

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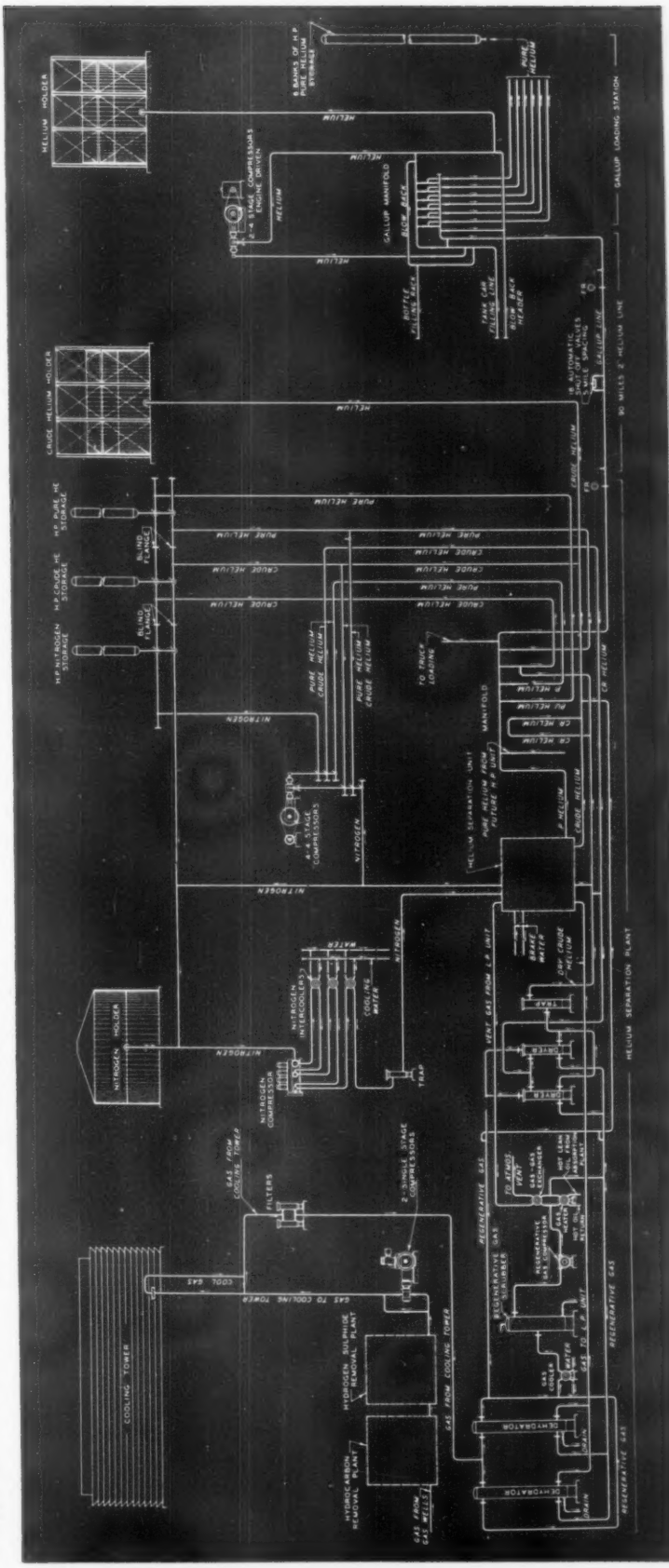
The purified helium of 98.5 per cent concentration coming from the helium purifiers enters the 2-in. extra-heavy pipe line to Gallup at a pressure of about 2,500 psi. or is shunted to the 120-cylinder high-pressure (1,800 psi.) storage depending upon shipping orders. At Gallup, helium from the pipe line goes directly into helium tank cars consisting of high-pressure cylinders arranged horizontally and fastened rigidly in racks on railroad cars. The cars are spotted along the loading dock for convenience in making the necessary piping connections from the pipe line to car. This step completes the operation of the entire system.

Outstanding in the design, construction, and operation of the plant is the conservation of energy (power) and equipment, and the design of the plant to take advantage of all that has been learned by the Bureau staff during the last quarter century about the production and handling of helium. The system and technology of this development are unique and peculiar in the petroleum and gas industries, and find no exact counterpart in either. Consequently, the helium engineer is a highly trained, experienced specialist who in many cases, and outside of the general physical and chemical laws known to science, must go on his own and develop his own technology and "know-how." The very high pressures, extremely low temperatures at which he operates, the low concentration of helium in the gas he processes and the total gas produced all are conditions which set apart the problem of the recovery of helium from most industrial or manufacturing operations. Every effort was made in designing this plant to reduce the amount of equipment required for the desired capacity; much second-hand material was used. The small village constructed for personnel living quarters was built along the lines of the best developments in this field of unit home design, and supplies the occupants with every essential modern advantage and service. The organization is worked out to be a self-contained and self-sustaining unit.

The engineering and consulting phase of the development of this plant was carried out in a very cooperative manner by Hudson Engineering Corp., Houston. This company designed and constructed the entire plant and its auxiliaries with the exception of the helium separation unit which was designed and installed by Bureau of Mines helium engineering staff. W. M. Deaton and E. M. Frost acted for the Bureau of Mines in the capacities of resident engineer-in-charge and assistant resident engineer, respectively.

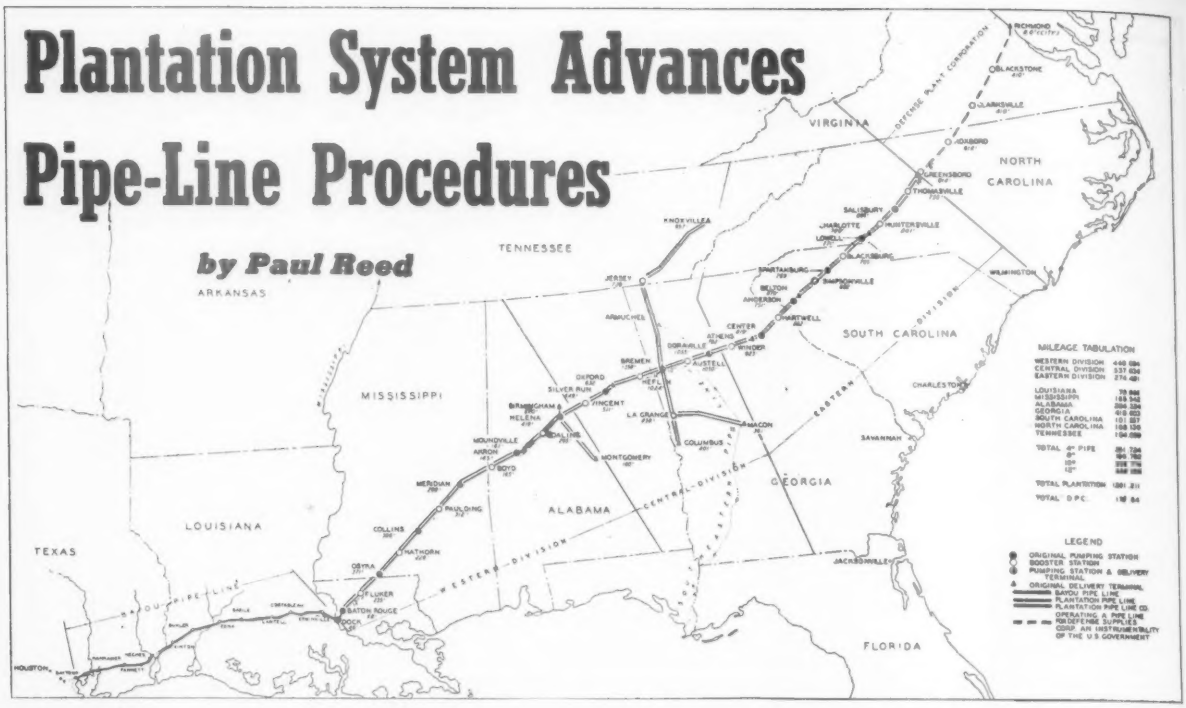


General flow chart of purification and helium concentration process in the Navajo helium plant (Courtesy, Hudson Engineering Corp.)

XUM

Plantation System Advances Pipe-Line Procedures

by Paul Reed



Map of Plantation system showing main line and laterals as well as the Bayou Pipe Line Baytown, Tex.-Baton Rouge, La., feeder system and the extension operated for Defense Supplies Corp. from Greensboro, N. C., to Richmond, Va.

THE Plantation Pipe Line Co. system originates at Baton Rouge, La. At this location the company has a main-line station and a tank farm comprising 1,500,000 bbl. of working tankage. In addition, a modern dock station has been erected on the Mississippi River to pump products from barges, tankers, or the refinery of the Standard Oil Co. of New Jersey division to the tank farm. Products are also received from the Bayou Pipe Line operating from the Houston-Texas City - Beaumont areas in Texas, which was constructed as an emergency wartime project. This system is an important source of products for Plantation Pipe Line system.

The Plantation line traverses seven southern states in its route to Richmond, Va. At Helena, Ala., and Bremen, Ga., branch lines serve Birmingham and Montgomery, Ala.; Chattanooga and Knoxville, Tenn.; Macon and Columbus, Ga.

The Plantation Pipe Line Co.'s 1,261-mile products system now has a singular significance after more than 3 years of operation (to the above has been added 179 miles of 8-in. line extending to Richmond which is Defense Plant Corp. owned and Plantation operated.)

The high efficiency with which the system has functioned during the war period when it has attained a normal input of 95,000 bbl. daily has demonstrated the value of features of the original design producing for a minimum of change to effect a 50 per cent expansion of the peacetime capacity of 60,000 bbl. On a 24-hour test in January of this year, the record for 12-in. petroleum pipe lines was broken with a throughput of 100,250 bbl. in the Baton Rouge, La.-Bremen, Ga. section of the Plantation line. The main tube system from Baton Rouge, excluding lateral lines but including the Greensboro, N. C.-Richmond, Va., extension, is operated with 98 per cent load factor over a stretch of 992 miles with 33 stations, 16 take-off points, including 6 at pump stations, for deliveries to consignees.

C. R. Younts, president, Plantation Pipe Line Co., at entrance to pump station

This is accomplished with only one spare pumping unit installed at the initial station at Baton Rouge.

At this time, when the pipe-line industry is approaching the changes expected in the postwar period, the practices of the Plantation line represent a high point in technical progress. Even more noteworthy are the advanced management methods to which much of the success in attaining high efficiency is attributed.

In this article a few of the features of the Plantation system are described, including the manner in which shipments are handled through the line and the economical limits to the location of pipe lines. Later articles will deal with technical procedures and management methods.

The main points in the original design are already generally known. For wartime operation, it should be mentioned that of the 33 main-line stations on the Baton Rouge-Richmond truck system, 14 are Plantation's temporary intermediate stations, while 4 are stations on the DPC extension. In addition, there are two lateral-line stations, making a total for the whole line of 35.

The trunk line telescopes from Baton Rouge, from west to east, with 456.11 miles of 12-in. to Bremen; 356.78 miles of 10-in. to Greensboro, and 178.89 miles of 8-in. to Richmond. Lateral lines total 251.72 miles of 4-in. and 196.70 miles of 8-in., making the mileage of the entire system total 1,440.20.

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AS OF SATURDAY, JUNE 30, 1945

RESOURCES		LIABILITIES		
Cash and Due From Banks	$ 69,133,115.29	Deposits		$302,351,770.91
U. S. Government Obligations, Direct and Fully Guaranteed	173,180,797.28	Acceptances Account of Customers and Letters of Credit		983,688.68
State, County and Other Public Bonds	21,191,511.32	Dividend Declared, Payable July 2, 1945		84,000.00
Other Bonds and Securities	864,573.32	Accrued Interest, Expenses and Reserves		947,076.87
Loans, Discounts and Acceptances	48,131,625.90	Capital	$2,800,000.00	
Customers' Liability Account of Acceptances and Letters of Credit	670,716.11	Surplus	7,200,000.00	
Stock of Federal Reserve Bank	300,000.00	Undivided Profits	3,365,937.98	
Accrued Income Receivable and Prepaid Expenses	840,043.41	Reserve for Dividend not Declared	168,000.00	13,533,937.98
Banking House, Furniture and Fixtures	2,772,910.73			
Branch Banking Houses	640,414.43			
Other Real Estate	174,766.65			
TOTAL	$317,900,474.44	TOTAL		$317,900,474.44

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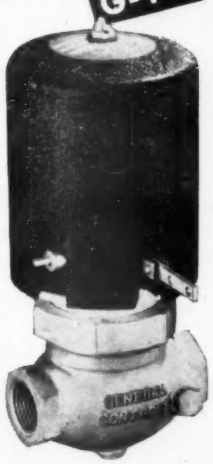

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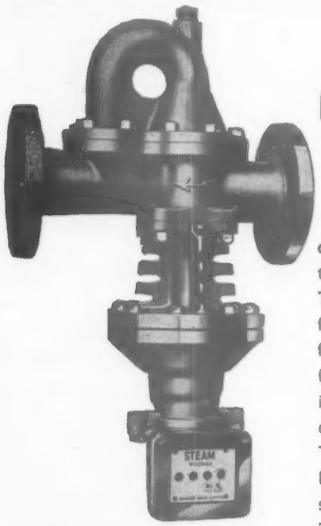

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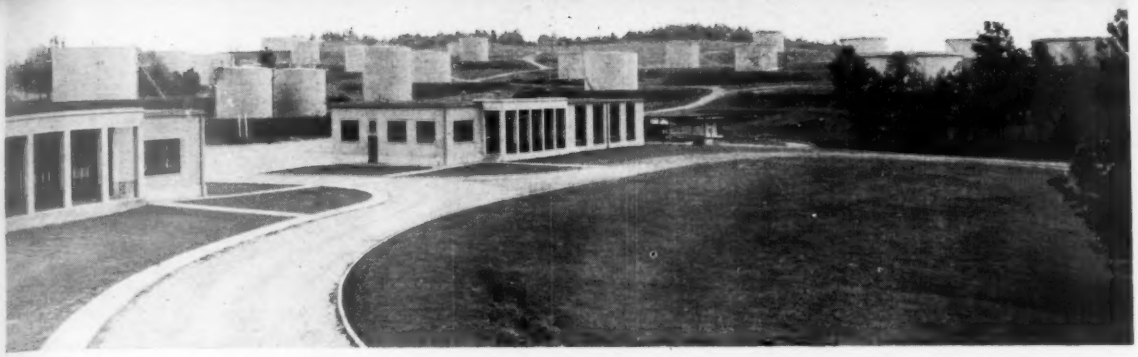


Bremen, Ga., terminal, with division office, pump station, and tank farm. From there products are pumped through lines in three directions

Total connected horsepower on the Plantation Pipe Line is 55,000 including auxiliaries, lighting and heating. The average electric energy consumption is 20,000,000 kwh. per month. Cost per kwh., including demand charges, is approximately 8 mills. The company is one of the largest purchasers of power in the Southeast.

Engineering data on trunk-line equipment are briefly as follows: Piping at stations has been designed so as to approach as near as practicable a single-tube system. This has been done in such a way as to reduce contamination pockets to a half fitting wherever possible.

Centrifugal pumps operating at 3,600 r.p.m with efficiency of 84-85 per cent, are of a 3-stage type on the 12-in. line and 4-stage on the 10-in. line. The pumps are installed with two units per station in series, each pump taking all of the capacity and putting up one-half of the station pressure.

Pump cases were designed to take impellers for ranges of 60,000 to 90,000 bbl. per day on the 12-in. line without appreciable loss in efficiency, and of 42,000 to 63,000 bbl. per day on the 10-in. line.

An explosion resisting, self-cooled induction motor operating at 3,600 r.p.m., 2,300-volt, 3-phase, 60-cycle is directly connected to each pump. On the 12-in. line, motors have 94.3 per cent efficiency while delivering 600 hp.; 95 per cent efficiency for 900 hp. On the 10-in. line the motors have 93.6 per cent efficiency for 450 hp. or 94.5 per cent for 600 hp.

Hydraulic control at each station makes it possible to put the energy of each pumping unit into the main-line stream at a rate which will not create unfavorable pressure waves, which affect the entire main-line operation.

Pressure actuated switches protect pumping units against excessively low or high pressures. Thermocouples aid in protecting against damage when there is an excessive temperature rise in bearings or motor windings.

Each station is equipped with a remotely located and controlled oil circuit breaker (120 ft. from the station) for shutting down the station on the occurrence of an unusual condition. Communication is by means of teletype. The teletype facilities include selective ringing apparatus so arranged as to ring a bell and light a prominently displayed red signal to call the operator's attention at any particular station the dispatcher desires.

Construction of the line and of the original permanent stations was started in the fall of 1941 and finished early in 1942. To raise capacity from 60,000 to 90,000 bbl., the intermediate stations were built in the fall of 1942. To adjust for the higher throughput, it was only necessary to replace impellers in pumps and fans on motors at the original permanent stations.

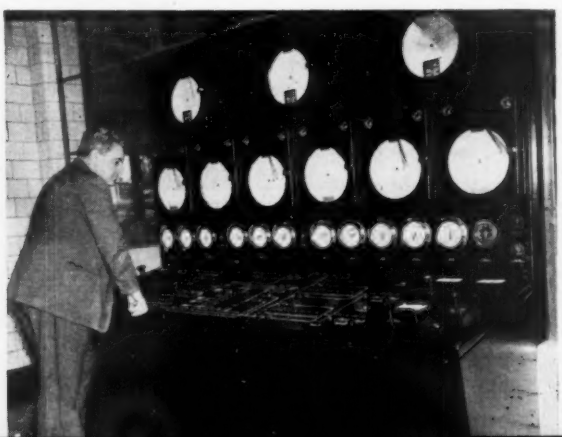
The intermediate temporary stations, built solely to meet war demands, include all four on the DPC extension and 14 on the Baton Rouge-Greensboro line. These have pumping equipment identical with that at the permanent stations on the same section of the line. Station construction materials of the temporary intermediate stations necessarily were affected by wartime restrictions.

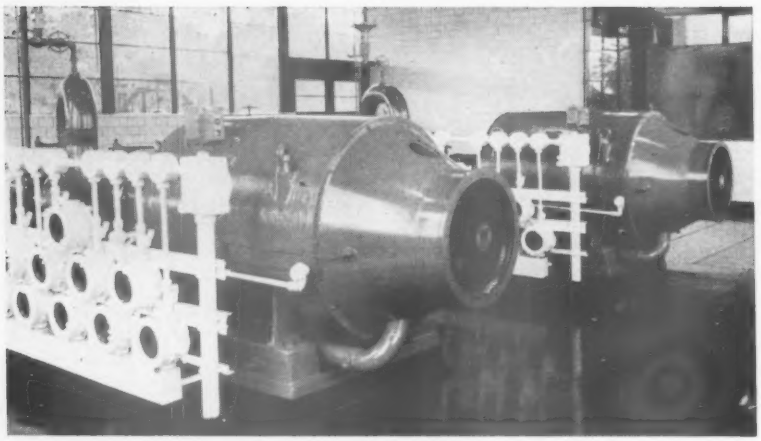
The Plantation system is owned jointly by Standard Oil Co. (New Jersey), Standard Oil Co. (Kentucky), and Shell Union Oil Corp., which have terminal and storage facilities at numerous points along the line. Shipments are also handled for The Texas Co., Pure Oil Co., Crown Central Petroleum Corp., American Oil Co., Pan American Petroleum Corp., and Gulf Refining Co.

Shipments are scheduled by shippers 30 to 60 days prior to moving the products through the line. It has been said that the delivery of gasoline has been scheduled before the crude from which the gasoline is manufactured is pumped from the wells.

In scheduling shipments, batches

Left: Control room of pump station in which air pressure is maintained higher than atmospheric to exclude vapors which might penetrate from the pump room during emergency conditions. Right: H. B. Britton, general superintendent, at control board with recording and indicating gages, schematic diagram of station piping, signal lights and push buttons for stopping and starting units in the pump room beyond the glass partition





Pump room at the Doraville, Ga., pump station with two four-stage 3,600-r.p.m. centrifugal pumps driven by explosion resisting, self-cooled, induction motors operating at 2,300 volts, direct connected

of different products are arranged in the line in a sequence which is conducive to reducing to a minimum the loss of products by mixture at the points of contact. The ideal sequence is: (1) Premium gasoline, (2) housebrand gasoline, (3) kerosene, (4) diesel fuel, (5) kerosene, (6) tractor fuel, (7) housebrand gasoline.

The following table shows the approximate mixture between various products in the line:

Numerous factors, such as temperature, viscosity, and density of the fluid, influence the rate at which products can be pumped through a pipe line. Because of these factors the throughput rates vary with the seasons of the year and according to the ratio of light motor fuels to heavier fuels handled through the line. The following lists the summer pumping rates for the products currently being handled through Plantation Pipe Line system.

Baton Rouge to Bremen (12-in. line)—	Maximum bbl. per day
Gasoline	98,500
Tractor fuel	95,000
Kerosene	93,500
Diesel fuel	87,000
Bremen to Greensboro (10-in. line)—	
Gasoline	68,000
Tractor fuel	65,500
Kerosene	64,500
Diesel fuel	60,000
Greensboro to Richmond (8-in. line DSC line)—	
Gasoline	32,000
Tractor fuel	29,500
Kerosene	29,000
Diesel fuel	27,000

Combination of products, a wartime governmental measure, permits Plantation to operate at higher throughput and efficiency. In effect, all products of similar specifications may be combined into so-called common stock. Because of this, batches are larger and flexibility of operations is greater.

Batch sizes on the Plantation system at present are approximately as follows: Housebrand gasoline, 300,000 bbl.; premium gasoline, 115,000 bbl.; kerosene, 160,000 bbl.; tractor and diesel fuels, 50,000 bbl. each. Approximately 85 per cent of the shipments are housebrand and premium gasolines.

Shipments of motor fuels are scheduled through the Plantation Pipe Line on 5-day repetitive cycles. Shipments of fuels including kerosene and diesel fuel are scheduled on 15-day repetitive cycles.

However, the above schedules are subject to revision to meet the direct requirements of the shippers.

In the short time during which the Plantation line was operated before wartime regulations became effective, products of different brands were batched through the Plantation system. Under these conditions as many as 19 different-specification products were handled with 13 batches traveling through the line at one time.

Delivery of products to Richmond, through the Plantation extension (owned by DPC) is regarded as entirely a war emergency function. The Greensboro line was originally planned so that it would be favorably located to serve territories where it would not be seriously affected by direct tanker and barge competition.

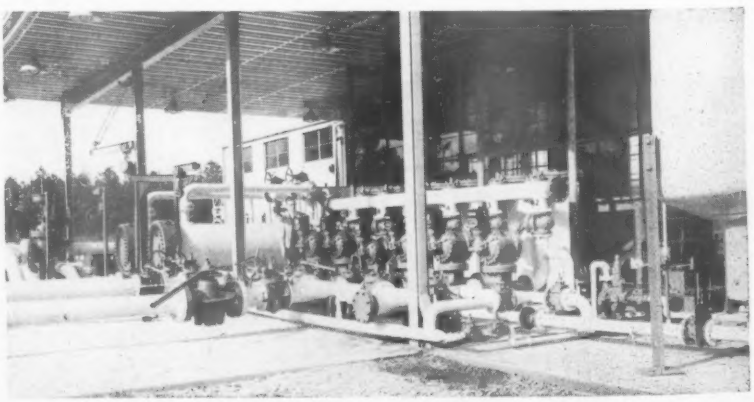
Pipe lines cannot compete with barge or tanker transportation. Government regulations and inequitable tax burdens limit the geographical location of pipe lines to areas where water transportation is impractical. Since the Greensboro-Richmond extension ends at practically tidewater, operation of this DPC-owned facility will be uneconomical in the postwar period.

Subsequent articles will explain details of the engineering features of the Plantation system and will discuss the methods used to obtain excellent employee-employer relations.

BATCH SHIPMENTS

Product—	Size of batch in bbl.	Mixture at contact point in bbl.	Loss or gain to product, bbl.
Premium gasoline	115,000	415	0
Housebrand gasoline	300,000	860	+430
Kerosene	160,000	650	—755
Diesel fuel*	50,000	650	+650
Kerosene—buffer	Buffer	330	—490
Tractor fuel*	50,000	650	+165
Housebrand gasoline	Buffer		0

*These products do not go beyond Bremen; therefore, spread of contamination is less.



Doraville station manifold with filters, meters, and part of calibration tank

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MODERN *Rotary Drilling Machinery* AND PRACTICES

Part 4—Slush Pumps and Rotary

by W. S. Crake

In this installment, the fourth of a series by the assistant chief mechanical engineer, Shell Oil Co., Inc., Houston, both power and steam direct-acting slush pumps are discussed, as well as the modern rotary. The series of seven articles dealing with all phases of rotary equipment and operational practices started in the July 7 Journal.

IN any discussion of slush pumps, it is necessary to keep in mind a clear picture of cause and effect. In any given formation using a sharp bit, fixed rotary speed and fixed weight on the bit, there is an optimum volume of mud which will give the proper bit cooling, and cleaning and removal of cuttings. This quantity of fluid in gallons per minute is the key to drilling efficiency, which is, in turn, directly proportional to achieving the maximum life of and footage drilled by the bit on bottom. Anything below this volume lowers drilling efficiency; anything above it is wasted effort.

Even with poor drill pipe-to-hole size ratios the annular velocities are usually high enough to remove the cuttings, if sufficient rate is being maintained through the bit. Cutting removal is, therefore, in most cases a secondary action of the circulating stream and is automatically satisfactory with proper drill pipe-hole ratios and circulating rates.

The effect of this flow on the circulating system is to induce a back pressure the amount of which is dependent, as in any other hydraulic flow system, on the design of the flow channel and has nothing to do with the pump itself. A clear understanding of this picture will permit the operator to use his rig economically by proper sizing of the hydraulic system and thus increase the drilling depth of the rig and reduce the operating cost of the over-all hydraulic system, which is the most expensive part of the rig to operate.

As a representative example, which is close to being accurate, let us assume 9⅞-in. hole is being drilled in medium hard formation at 10,000 ft. with 4½-in. drill pipe, using full-hole tool joints, and a rock bit. Also assume that about 40 gal. per minute per inch of bit diameter, or a total of 400 g.p.m. of circulation, is needed by the bit for efficient life. At 400 g.p.m., with standard bit nozzles, there is, say, 50-psi. pressure drop across the bit. There is a pressure loss of about 60 psi. for 10,000 ft. in the 9⅞-in. by 4½-in. annulus. (See Fig. 3 in Article 3 of this series). Drill pipe and tool joint losses are approximately 780 psi. (See Figs. 1 and 2 in Article 3) and assume that surface line, hose, kelly and drill collar losses are 100 psi. The total back pressure, or pump pressure, is thus 990 psi. of which 880 psi. is loss, or 89 per cent all the way down to the bit entrance. The circulating system efficiency in this case is 11 per cent as determined by the formula:

$$\frac{\text{Bit pressure loss} + \text{annular loss}}{\text{Total pump pressure}}$$

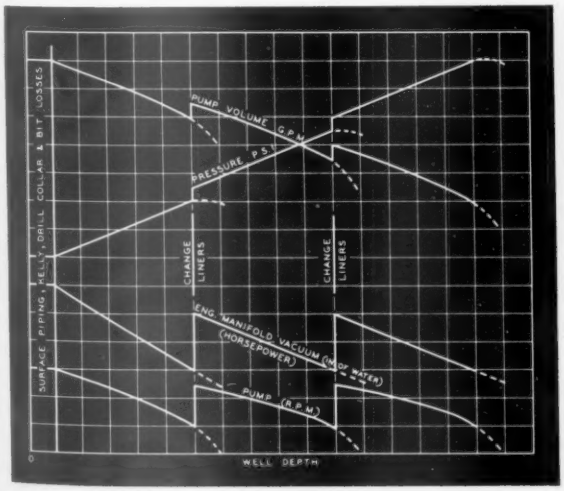

Fig. 1—Performance factors of typical power slush pumps, as a function of depth

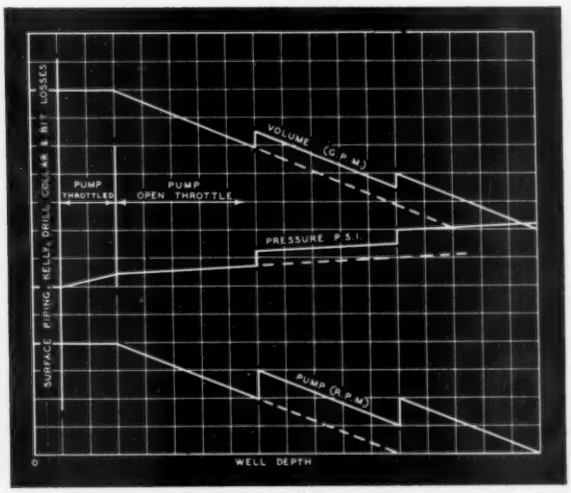

Fig. 2—Performance factor of typical direct-acting steam slush pumps as a function of depth

XUM

The horsepower input to the pump with 400 g.p.m output at 990 psi. pressure is 270 hp.

By increasing the drill-pipe size to 5 ⅞ in. in the above example, the drill-pipe loss drops to 250 psi., the annular loss rises to 92 psi. the other losses remaining constant. The efficiency thus becomes 20 per cent, the over-all circulating pressure 550 psi., and the horsepower input to pump becomes 150 hp., saving 130 pump horsepower, or 48 per cent.

The limit to the above efficiency is, as stated in a previous article, that the annular loss should not exceed about 400 psi. or some value such as to avoid blowout hazard on stopping the pump. In addition, any bit pressure drop used which is beyond that generally recommended by the manufacturer and which is seldom over 125 psi. even on fish-tail bits should be included in the drill-pipe loss. The maximum efficiency possible on a long drill-pipe string by the above formula would be under conditions such that the losses down to the bit equalled the annular loss. This would make the maximum possible efficiency less than 60 per cent and good efficiencies would be 18 to 30 per cent on deep wells.

Power Slush Pumps

The author deliberately discusses power slush pumps ahead of steam direct-acting pumps for the reason that few operators of drilling rigs really obtain a clear picture of fluid pumping until they have learned to operate power slush pumps successfully.

On power pumps, installed with correct engine-to-pump ratios and sufficient engine horsepower to actuate the pump properly, a study of pump pressure buildup, engine speed, which is almost directly proportional to pump output, and engine vacuum, which can be translated into pump horsepower input, is highly educational.

Pump liners are changed at a definite point and at relatively high pump speed in order to be able to maintain enough fluid volume to drill properly, and to avoid engine overload. Three instruments are necessary for the driller to watch. The first is the mud pressure gage, which must be watched to see that the pressure does not exceed that recommended by the pump manufacturer for the size of liner installed. The second is the engine vacuum gage which should not drop below, say, 5 in. vacuum, and thus overload the engines. The third is the pump engine tachometer, which may be using a scale to read pump speed. The latter may indicate fluid troubles or the reason why the engine vacuum-gage reading is low.

Fig. 1 shows typical curves of pump volume and pressure, engine vacuum and pump, or engine, speed. These are curves and assume constant bit and other drilling conditions throughout the assumed well shown.

Power pumps have not been built in output capacity to equal that of direct acting steam pumps, size for size. It should, however, be remembered that power pumps may be operated at somewhat higher average piston speed than direct acting pumps due to the harmonic piston motion. This motion does not tend to "break suction" as much as the instant-accelerating direct-acting type. This is especially true with gas-cut mud. Furthermore, a power pump always gives full stroke, whereas direct acting steam pumps "short stroke" sometimes 2 to 3 in. less than normal.

Thus, an 18-in. stroke power pump can almost invariably be depended upon to out-deliver a 20-in. direct acting pump with the same liner size at the same speed and within the pressure load rating of the power pump. When dismissing power pumps as inadequate for drilling in soft formation or deep wells, operators should consider the fact that this inadequacy is not nearly as real as the pump horsepower capacity figures indicate. This factor also can be largely rectified by using larger drill pipe or realizing that a considerable portion of the direct acting horsepower used is often wasted and caused by excessive circulation rates, bit nozzles too small, or sometimes by surface pipe lines too small, hose, kellys, etc.

The chief disadvantage of the power pump with direct mechanical drive is its inflexibility. This objection may be overcome by electric or hydraulic drive which enable power pumps to slip against the load, similar to the stalling action of steam pumps.

Admittedly, power pumps are not yet available of sufficient size for the deepest drilling, but for all except this service, where fuel economy justifies the high pump costs, properly engineered power pumping systems can give almost equal drilling performance to steam on normal sized holes. The very high volumes needed for drilling the upper parts of soft formations can be obtained by paralleling pumps. One enterprising operator in the Gulf Coast has a successful parallel pump unit with two pumps mechanically interlocked so that he has, in effect, one 4-cylinder pump, and can disconnect either pump when needed as a single pump.

		Liner Size	7-3/4"	7¼"	6¼"	5½"
RANGE ABOVE RECOMMENDED ENGINE OPERATING SPEED	55 Strokes per Minute (Engine Speed 990 RPM)	Gals/Stroke	14.09	12.25	8.98	6.79
		Max. Disc. Press.	750	860	1160	1560
		GPM Displacement	770	674	494	373
		Max. BHP Input	412	412	412	412
HEAVY DUTY DRILLING	50 Strokes per Minute (Engine Speed 900 RPM)	Max. Disc. Press	750	860	1160	1560
		GPM Displacement	700	613	449	340
		Max. BHP Input	374	374	374	374
	45 Strokes per Minute (Engine Speed 810 RPM)	Max. Disc. Press	750	860	1160	1560
		GPM Displacement	630	551	404	306
		Max. BHP Input	336	336	336	336
OPERATING RANGE	40 Strokes per Minute (Engine Speed 720 RPM)	Max. Disc. Press	750	860	1160	1560
		GPM Displacement	560	490	359	272
		Max. BHP Input	299	299	299	299
LOW SPEED OPERATING RANGE FOR SLOW CIRCULATION, IDLING ETC.	35 Strokes per Minute (Engine Speed 630 RPM)	Max. Disc. Press	750	860	1160	1560
		GPM Displacement	590	429	314	238
		Max. BHP Input	262	262	262	262
	30 Strokes per Minute (Engine Speed 540 RPM)	Max. Disc. Press	750	860	1160	1560
		GPM Displacement	420	368	270	204
		Max. BHP Input	224	224	224	224
	25 Strokes per Minute (Engine Speed 450 RPM)	Max. Disc. Press	750	860	1160	1560
		GPM Displacement	350	307	225	170
		Max. BHP Input	187	187	187	187

Fig. 3—Operating range for 7¾ by 18-in. power pump, 2⅜-in. piston rods, gear ratio 5.48:1, engine sheave 19.5 in. p.d., pump sheave 64-in. p.d.

Running of power pumps in series for high pressures has not been successful and is inherently difficult. In order to perform this successfully, without danger of harmful shock loading to pumps, it is necessary to obtain an almost dead smooth flow into the suction of the high-pressure pump and also for the high-pressure pump to be able to run at exactly the right speed to pick up this flow and boost it to the high pressure. Due to the high inertia of pump moving parts, and the fact that pistons and valves have a habit of breaking down or leaking one at a time, etc., the problem is one of extreme difficulty. If compounding is accomplished with real success, it would unquestionably involve a high cost shock absorbing, volume absorbing and transmission setup. It is probable that a special high-pressure pump, with relatively low volume, for high-pressure service, can more satisfactorily answer this problem. This matter is a pressing one for the industry, especially on workover rigs. A 225-hp. output, 5 by 10-in. duplex, or 4½ by 7-in. triplex pump would probably answer this problem.

Most power pumps on drilling rig service are of the duplex or two-cylinder type, but triplex, or three-cylinder pumps have now appeared on the market. The chief advantage of the triplex pump is that the lower peak pressures, caused by its six power impulses, enable pumps of equal output capacity to be built of lighter weight or allow greater capacity for the same weight. The impact loading on pump parts being lower, a properly designed triplex pump should give somewhat less valve and piston wear when fully loaded as long as the pumping pressures are within the mechanical ability of the moving parts to stand the loads.

Pulsations on duplex pumps can be effectively dampened by simple air chambers if of the right type and installed in the derrick. These should be at least 40 ft. long for high-pressure drilling and should be of the type which are automatically drained and refilled with air each time the pump bleeder valve is opened.

The effect of pump pulsation on drilling itself is probably negligible since the drill pipe is elastic. The wall friction, mud in the annulus, and bit nozzles comprise an almost perfect damping system. In support of this, many readers will remember the old "mud hog" oil-line pumps running wide open and causing the pipe line at the pump to dance around on the ground by pulsation. Half a mile away, however, the pipe and stream of oil into the tanks or pits was perfectly steady even through an open pipe.

On steam rigs, the use of one power pump driven by a separate drilling engine is the largest single steam saving device which can be applied on the rig. On a 400-hp. input power pump, for example, a drilling engine, used to drive the pump, should use only about 13,000 lb. of steam per hour or about 384 boiler horsepower, whereas a conventional direct acting steam pump will use about 25,000 lb. per hour. This gives a steam saving of 48 per cent in favor of the power pump. The limitation to the usefulness of this is that the power pump has the horsepower limitations previously mentioned, and it would require two parallel power pumps in many cases to equal the output of one large direct acting steam pump. This setup would be extremely expensive and cumbersome, and it would often be difficult to justify the expense. Whenever a 600-hp. power slush pump is available, the picture should be considerably changed in this respect.

A power pump could be readily run in series or compounded with a steam pump under extra heavy load conditions. The steam pump should be preferably the high-pressure pump in this case, so that the larger proportion of horsepower load would tend to be supplied by the more economical steam-power pump.

Steam Pumps—Direct Acting

Fig. 2 shows typical characteristic curves of a conventional direct acting steam pump.

The performance and flexibility of these pumps is ideal for drilling service and the pump itself is the simplest type of machine available. It is, however, a "steam hog" and has a consumption rate of 60 to 75 lb. per horsepower-hour output. These pumps automatically adjust their speed to the back pressure of the pumping circuit and gradually slow down as the pressure increases. In case of bit plugging, the pump stalls and maintains full boiler pressure against the steam piston. In parallel or compounded service, one pump cushions flexibly against the other and the low inertia of moving parts causes no difficulty in either service, even if the liner sizes are different.

Wherever fuel and water cost is not an important factor, there is little doubt but that the performance and flexibility obtained with these pumps is worth the extra boiler capacity required for their operation. In any event, the combined cost of the pump and extra boiler plant is far less than power pumps, without the driving engines, of comparable capacity.

Selection of Ratios and Sizes

Most power slush pumps are rated by manufacturers at maximum speeds which are too high to be used on heavy-duty drilling. It is difficult to compare the capacity of various makes of pumps unless a common mean piston velocity is used as a yardstick. As a convenient and suitable measure, the writer assumes that 140 ft. per minute mean velocity on each piston is the maximum which can be expected with heavy drilling mud containing gas before suction troubles are likely to occur.

When the maximum speed is calculated by the following formula, using 140 piston feet per minute per piston:

$$\text{Max. r.p.m.} = \frac{840}{\text{Pump stroke in inches}}$$

and the pump horsepowers and capacities are changed in direct proportion to this r.p.m., a true picture of comparative pump rating is obtained, and this picture surprisingly raises capacity of some pumps and lowers that of others from the published figures.

When selecting engine-to-pump speed ratios, it is advisable to set the maximum pump speed, as calculated above, to be obtained with the engine running at maximum continuous rated r.p.m. Fig. 3 attached shows a tabulated actual pump setup in such form that the drilling crews can follow the effect of reducing liners, pump speed, capacity and horsepower loads.

If the engine available is too small to supply the full pump output horsepower, the ratio should be set so that the pump is slowed down to the point where it can be fully powered by the engine while running at full continuous rated speed. By gearing the pump for full speed, the engine is easily overloaded and poor pump and engine performance must be expected. From Fig. 3, for example, if an engine capable of only 300 hp. continuous rating at 900 r.p.m. is available, the ratio should be such that the pump runs at 40 r.p.m. with the engine at 900 r.p.m.

Figs. 1 and 3 show the effect of liner changing. The effect of reducing liners on power pumps is usually that the pump speed increases, more horsepower is thus delivered to the pump, and the volume output generally increases with the smaller liner. This is also true to a large extent on steam pumps and increases the pumping efficiency in any case.

Rig Pumping Plants

On most rigs, one main drilling pump of the correct size is needed. Since the pump is essential for continuous drilling, and drilling speed is seriously impaired if insufficient pump is available, it is common

(Continued on page 150)

Power-Driven Tong Is New Tool for Uniform, Efficient Tubing Jobs

by Kenneth B. Barnes

Engineering involves constant search for efficiencies, desirable mechanizations, best utilizations of manpower. Based on the fact that generated horsepower is substituted for manual or muscular "push and pull," the power-driven tubing tongs described here are an interesting innovation in oil and gas well servicing operations.

POWER-DRIVEN tubing tongs are now in routine field use which take the "grunt" out of making tough break-outs and make-ups in tubing jobs. Besides eliminating strain and fatigue placed on servicing crews where tight joints had to be broken out manually by physical strength, the new tool assures uniformity in making up joints to preset final desired torque. In breaking out, also, no hammering of couplings is necessary with attendant possibilities of deformation and thread damage.

The power tongs, manufactured by Hillman-Kelly, Los Angeles, Calif., are being used by a number of California oil companies and recently were previewed under a variety of service operations in a number of Mid-Continent and Texas fields. The particular set of tongs and the auxiliary portable air compressor used in these latter demonstrations previously had been purchased by a major company and now are scheduled for regular service in one of its southwestern producing areas.

Fig. 2—Tong operator using the machine on a tubing job at a Seminole, Okla., well. Joints are all uniformly made up

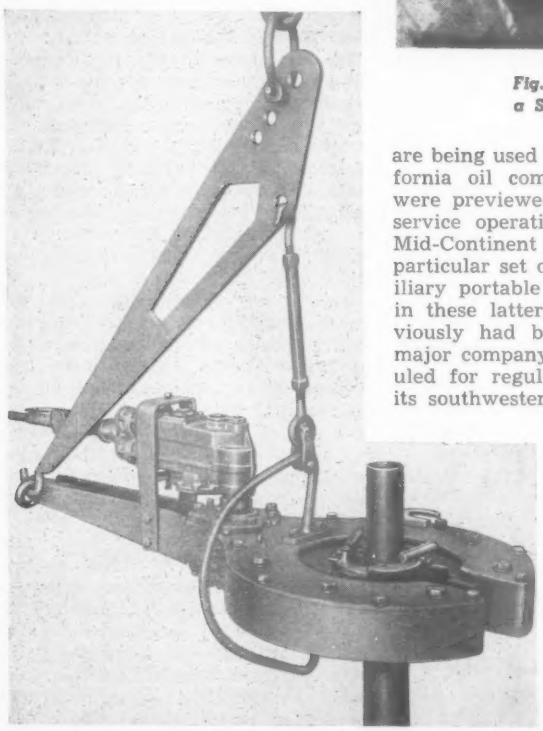

Fig. 1—This power tong, fitting 2, 2½, and 3-in. tubing, is actuated by an integrally mounted air motor which can develop 250 ft. lb. stall torque at 80 psi. pressure. Entrance of tubing to tong case and rotor is through 4-in. slot. A roll-over ring is provided so tong may be turned over

The power tong (see Fig. 1) handles 2, 2½, and 3-in. tubing. While much lighter, principle used is somewhat similar to that employed in a rotary table, although the rotor or ring-gear driving table is revolved by an air motor of the vane-impeller type. Only about 100 psi. air pressure is needed to drive the motor. Air consumption is of the order of 20 cu. ft. per minute, the exact requirement, of course, depending upon condition of the specific job handled.

Make-up of Power-Tong Set

In service the tongs are suspended by a line from the derrick or portable mast, and a back-up line is tied from the tong handle clevis to a derrick leg or fixed member support. Rigging up takes only a minute or two, then the tong operator has little more to do than open and close a valve to have the machine make up or unscrew the joints entirely under its own power.

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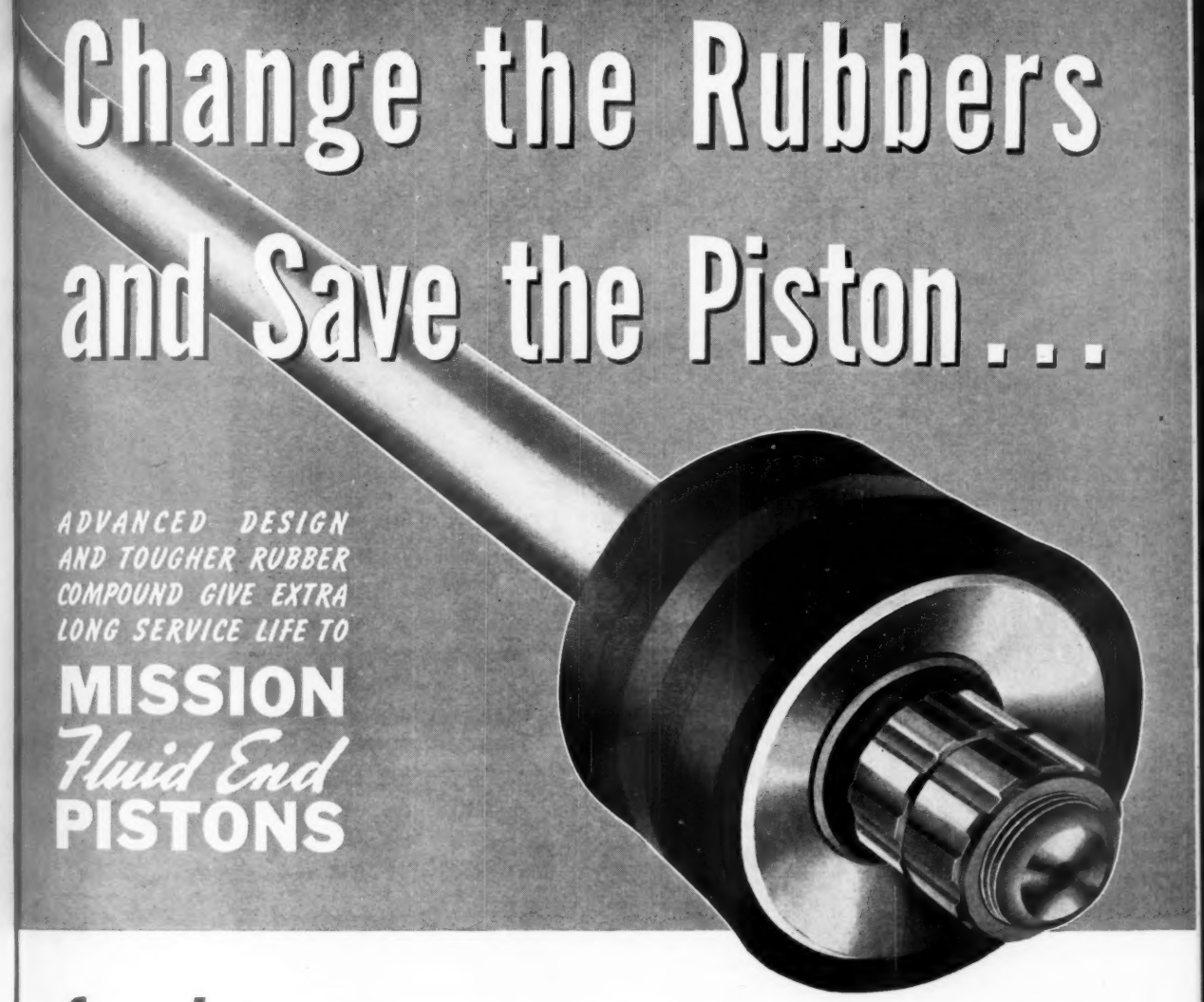

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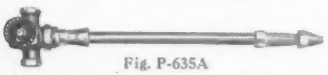

Fig. P-635A

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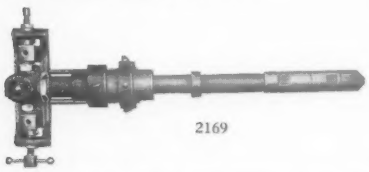

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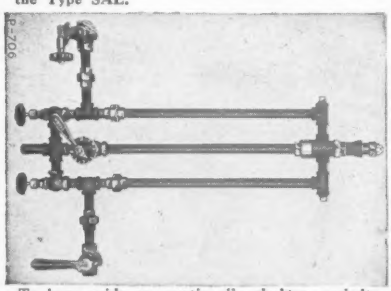

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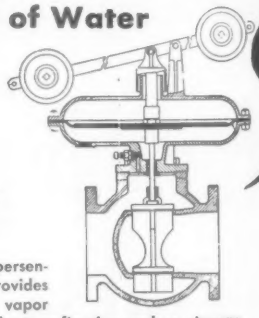

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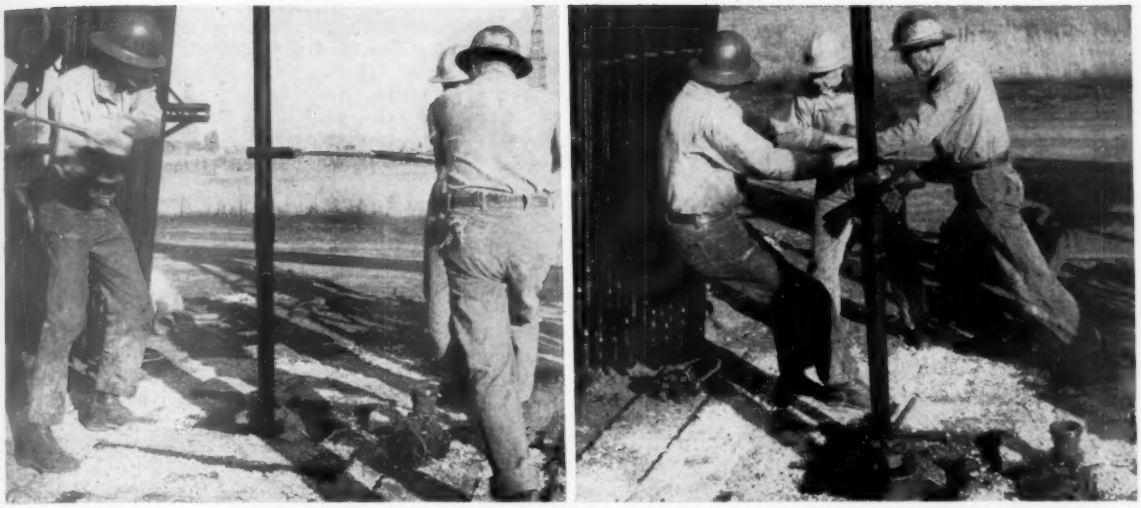

Fig. 3—It is not necessary to hammer couplings in breaking-out, or for the heavy push-and-pull strains involved in making or unmaking some joints

Air supply under constant pressure regulation enters the air motor through a hand grip throttle valve. The air motor drives a vertical spindle which is equipped with both a high and a low speed gear. This, through a cluster gear, turns the two driver gears which revolve the rotor.

The rotor, or ring gear, floats upon six ball-bearing mounted guide rollers which are placed radially in the tong case at the outside diameter of the gear. The ring gear has no fixed center, and the rollers guide the ring gear and accompanying inner anchored tong jaws in a true circle.

Both the tong case and the rotor have a slot or split area approximately 4 in. wide. When the two slots are coincided the tubing may be admitted or removed from the tongs at the side. Two driver gears are used so that whenever the slot in the rotor is opposite one gear, the other is fully engaged and driving.

In operation, many instances occur when the tong is to be swung free from the tubing but the slot in the rotor is not lined up in position with the slot in the tong case. This lining up, however, is readily accomplished by merely flicking the reverse control on the air motor so the rotor or table turns to the proper line-up position.

In inserting tubing, the jaws latch automatically. The jaw mechanism is entirely self-energizing. The jaws have two double-edge dies, and the four-link gripping mechanism minimizes any compressive action tending to crush the pipe. While these dies are recommended, they are replaceable with regular drill pipe insert dies which are readily available at supply stores.

In making up joints when running in a tubing string, the spindle is left in high gear, and the motor run in forward rotation. Air supply is set by the regulator to furnish pressure needed to give the desired screw or make-up torque. The hand-squeeze air throttle is opened and the rotor allowed to turn until a stall is reached.

At 80 psi. input air pressure the stall torque output of the tong in high gear is 843 ft.-lb., and in low gear it is 3,620 ft.-lb. The rotor speed in high gear is 48 r.p.m. and the speed in low gear is 11.2 r.p.m.

Once the pressure from the air regulator is set, therefore, it is seen that each screw-up operation is made to the same final stopping (or stalling) torque. The exact amount can be increased or reduced by simply increasing or decreasing the setting of the air pressure.

Breaking Out Joints

In breaking out tubing joints, the machine has the advantage of the high torque output available from the low gear for the demands that may be required for the initial start. After a few turns are made, the rest of the unscrewing may be made at high speed simply by shifting to high gear.

While principal features of the power tong are in accomplishing uniform make-up and tight joints, in eliminating hammering of couplings in breaking out, and in giving servicing crews a machine with which they can work efficiently, safely and easily, observations of typical field tests and time studies have shown the power tong to be somewhat faster than the straight manual procedure. Rather typical are the following spot data, using the power tong while running in a 5,650-ft. string of 2½-in. tubing in the Rosecrans field in California:

MAKING UP TUBING, TIME PER JOINT

Running time (seconds)	Snap-on and snap-off time (seconds)
15.0	17.5
13.0	20.2
13.4	17.3
15.0	18.8
12.3	18.7
12.0	20.0
14.0	19.0
12.2	18.4
13.3 avg.	18.8 avg.

Average running time for the 5,650-ft. string was 13.5 seconds per joint, and average snap-on, snap-off time per joint was 19.3 seconds.

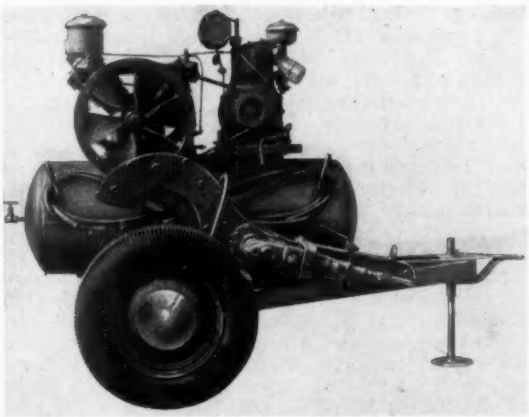

Fig. 4—Power tongs mounted conveniently on the portable gasoline-driven compressor for transportation between jobs

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In contrast, a somewhat similar job, which involved a 6,000-ft. string of 2-in. tubing in the Signal Hill, California, field, but where hand tonging was used, was spot-timed as follows:

MAKING UP TUBING

	Seconds
First check	36.4
Second check	42.0
Third check	37.8
Fourth check	45.0
Fifth check	57.4
Sixth check	38.3
Seventh check	47.7
Eighth check	38.7

Average time per joint for the entire 6,000 ft. was 42.0 seconds.

In a number of tests on the same wells, each time using the same tubing, direct comparisons have shown the power tong making up a joint in 17 to 20 seconds while 38 to 45 seconds were taken in the same job by hand.

Coming out of the hole (unscrewing) with the power tong requires about 15 per cent more time than when going in (making up), since the tong usually breaks the joint in its lower gear setting and is then shifted to high gear for spinning out.

To furnish compressed air for operating the power tong, and also for transporting the tong if it is not kept permanently hung in a portable mast or derrick, a trailer-mounted gasoline-engine driven compressor unit is used. A 15-cu. ft. air storage tank and built-in tong-carrying brackets are incorporated. The compressor provides an air supply of 25 cu. ft. per minute with discharge pressures up to 200 psi., and is powered by a single cylinder air-cooled 9.2-hp. engine.

Weight of the power tong is 400 lb. Outside length is 54¾ in., and maximum outside width 29 in. Weight of the complete compressor unit (less tong) is 1,400 lb.

Service Trials Outside California

Recently the power tong was field tested by a major oil company in pulling tubing from two 4,500-ft. wells in the Seminole area of Oklahoma. First job was on 2½-in. tubing and both the hand tonging and power-driven operations proceeded uneventfully. Average hand tonging took 40 seconds per joint, and the power breaking required 20 seconds. Next, a really tough job was selected. The well had 3-in. tubing which had not been pulled for several years, and the joints were firmly fixed together as the result of corrosive salt water producing conditions.

On the hand trial, six men could not break the joints without hammering the couplings, even though a "cheater" or "snipe" of 6-ft. leverage was used. The couplings had to be hammered severely before the joints could be hand broken, and even at best, procedure was very difficult and strenuous. When the power tong was tried, it stalled at once without breaking the joints when 100 psi. pressure was used. Of course, sufficient air pressure can be fed to the power tongs until they finally turn something. It was decided to try 150 psi. pressure, and under this condition the power tongs unscrewed the entire string without difficulty and without necessity of hammering a single coupling.

The power tong equipment was then taken to a lease in the East Texas field, near Kilgore, and used in handling 2½-in. tubing. Next job performed was on property in the McElroy pool of West Texas, and later a demonstration was made on a well in the Wink field on 2½-in. tubing and in conjunction with portable-derrick equipment.

Other Applications of Power Tongs

A number of other uses are possible with the power tong besides making and breaking tubing joints. The tong can be used, instead of a small rotary table, with a string of tubing for drilling out obstructions in reconditioning work, and with cutters for cutting casing, liners, etc. The tong can be used to thread 2 to 3-in. line pipe by stationing pipe dies in a fixed position at one end and then rotating the pipe with the tongs. The manufacturer also has built casing and drill-casing power tongs, and has given design consideration to such tools for sucker rod handling; however, these models are not now available.

Modern Rotary Drilling Machinery and Practices

(Continued from page 145)

practice to duplicate the drilling pump for use as a standby, for mud mixing and other purposes. On heavy drilling rigs, particularly in soft and hazardous drilling territory, a third pump of a smaller capacity is advisable for emergency use, for compounding if steam power is used or for other work.

On light power rigs in hard drilling territory, where pumps give negligible trouble and can be expected to complete a well if overhauled before starting, one pump is often used. In hard rock country, even on deep drilling rigs, one large drilling pump is used and a one-size-smaller pump installed as standby. The choice is dependent on experience, reliability of pumps, availability of emergency repair service, etc., but no hard and fast rules can be given. The only rule is that, if drilling progress is expected to be materially slowed down by failure of the pump and even a small possibility of such failure exists, a second unit should be installed for true economy.

On workover rigs, since most of the work is hoisting, fishing, etc., only one pump is normally necessary unless in dangerous wells likely to require delicate mud control and emergency pumps. The pump should, since small drill pipe and hole sizes are usually involved, have high-pressure, low-volume capacity, as compared with drilling pumps for the same depth. Exact requirement figures are difficult to give owing to the high drill-pipe and annular velocities involved. A volume of from 250 g.p.m. down to 100 with reduced size liners, and a pressure range for deep wells of from 1,200 psi. up to 3,000 psi., at the above volumes, is a suggested range. In order to provide these capacities for the low total horsepower hours involved, workover pumps can often be overloaded 15 to 20 per cent above their continuous drilling rating. This overloading requires care to prevent abuse, however, and its economy depends on the extra horsepower or load ratings of each manufacturer's product.

The Rotary

Modern rotaries are well designed for their accepted purposes and require little discussion. Most modern rotaries are spiral bevel gear equipped and of the precision built, fully enclosed type, and have long life, if used and maintained with care.

The chief question on rotaries is the best method of driving. It is generally agreed that the driving of the rotary by complicating the hoist is undesirable but usually economical. Many attempts at separate drive rotaries, including underfloor steam engine, floor mounted steam engine, direct engine drive and electric drive have been used.

In examining the speed, torque, and horsepower requirements needed, it is found that speeds needed are from 5 to 10 r.p.m. for delicate fishing, up to a normal 300 r.p.m. Horsepower requirements vary from perhaps 5 hp. on slow fishing to 300 or more at maximum drilling loads. Torque requirements are from very low amounts, for certain work, up to very heavy torque on bad fishing jobs. Reversing of the pipe is also necessary on occasions. The torque on fishing requires very fine sensitivity and control. While drilling, it is desirable to limit the torque to a reasonable figure well below the drill-pipe twistoff capacity.

It is easy to see that the above ranges are almost impossible to obtain in one machine with simplicity. If change-speed gears are used, torque sensitivity control is seriously affected. If no gears are used, speed sensitivity is reduced. The utmost in control sensitivity is needed

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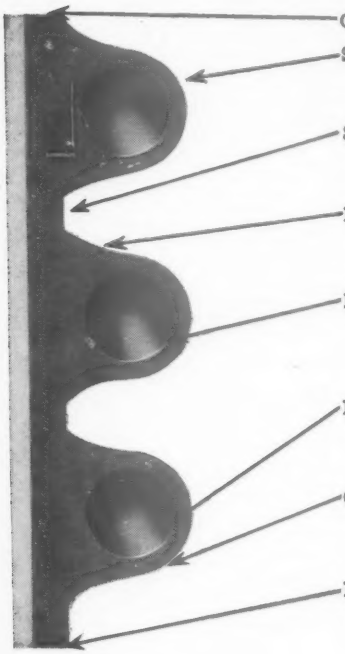

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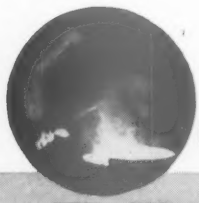

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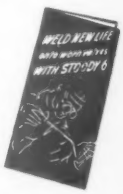

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For ordinary drilling on steam rigs, suitable sensitivity is obtained in speed and horsepower with the drilling engine. Torque and speed sensitivity are poor at extremely low speeds due to the high gear ratios, needed for maximum speed running, and the single-speed drive.

On power rigs, three speed drives to the rotary table are common, and speed sensitivity is good as long as the rotary is not tied to the same engines at the pump. Torque sensitivity is poor on the low speeds since the powerful engines can produce high rotary torque even when idling.

The widest control flexibility obtainable is with direct connected electric drive with which torque and speed sensitivity and control are of high delicacy. Hydraulic drives can duplicate this sensitivity, but it is probable that the cost of performing an equal job hydraulically may be greater than with the electric drive.

On power rigs when independent rotary drive is desired, d.c.-electric drive solves the problem of purchasing a large, otherwise unusable, engine and transmission for the rotary. The electric drive uses a motor which is powered from the common prime movers in the power plant and the latter can be used for pumping or hoisting when not being used to power the rotary. The elimination of any rotary drive parts in the hoist could usually more than pay for the electric motor on the rotary.

As is becoming increasingly common with other modern machine tool applications, it may pay the operator, or fishing company, to develop a special "fishing rotary" of super-sensitivity rather than to try to cover the complete range of well operating conditions with one machine which does not have proper characteristics for the job.

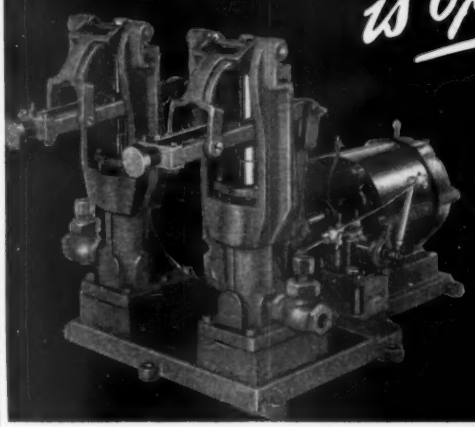
Eugene M. Cannon, recently named division manager of the East Texas division for United Gas Corp., joined the company in Houston in 1930 as field supervisor. He has served as district manager at Crowley, New Iberia, and Lake Charles, La.

Don McCauley, formerly in charge of the Shreveport office of British American Oil Producing Co., has been named district geologist of a new office opened in Houston.

James E. Kilday, former director of the motor transportation division of the Texas Railroad Commission, was made chief of the transportation and utilities section of the Justice Department, antitrust division, on July 10.

You can change the Dose

While the pump is operating



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A MICRO-SCREW adjustment permitting volume variation over the entire capacity range of this pump while it is in operation makes it an unusually flexible and popular unit. For predetermined accuracy, it can be equipped with a special indicator for calibration of feeding. "M" Type pumps are widely used in the petroleum, food, chemical, paper, steel, soap, plastics and rubber industries for handling acids, caustics, phosphates, solvents, emulsions, inhibitors, molten materials, slurries, and many other substances.

123 pumps in the "M" Series offer capacities up to 1512 G.P.H.; pressures to 2900 P.S.I.

Other Hills-McCanna Pumps are available in capacities to 1500 G.P.H., pressures to 22,500 P.S.I.

Submit your requirements to "Proportioning Pump Headquarters" for a speedy, on-the-button answer to your needs.

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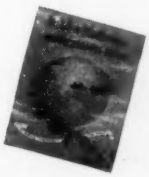
We're glad to have you have our catalog whether or not you are immediately in the market for pumps. Ask for a copy.



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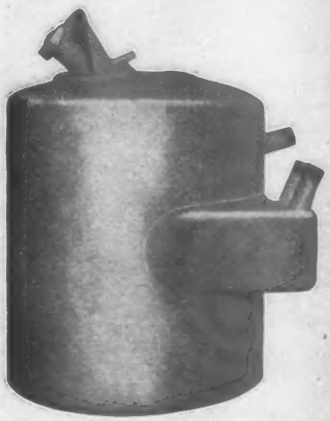

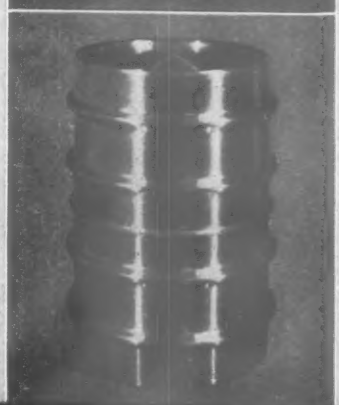

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TANKS IN ANY SIZE — FOR EVERY PURPOSE

EQUIPMENT FOR THE OIL, GAS AND PETROLEUM INDUSTRY

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Process of Thermal Cracking

Is there literature or a publication that gives a complete diagrammatical description of thermal cracking units now in operation? Would you care to recommend a book or other publication on patent procedure?—N. J. S.

Thermal cracking is such a universal practice that scarcely any patent rights are now recognized, and it is hardly possible to distinguish between the cracking plants of various licensors. The main difference between the various so-called processes lies in the mechanical features or hookups employed and in the advisory organization available to the licensee. The principles of operating cracking plants are now so well defined that competition forces all cracking-plant operators to use plants that are essentially the same. This situation has existed for about 10 years, and really 15 years except that not all operators were aware of the situation at that time. Nevertheless, it is quite possible that a totally different method of thermal cracking will be invented, but if so it will be such a novel process that it will have substantially no points in common with the processes or equipments now employed.

Diagrammatic descriptions of the various cracking processes by trade name are not included in up-to-date books because there are not sufficient differences to justify distinctions. Thus in the second edition of Petroleum Refinery Engineering, McGraw-Hill Book Co., Inc. (1941), pages 288-326 and 507-528, the process of thermal cracking is discussed, whereas in the older edition (1936) pages 475-487, several processes such as the Tubestill, Dubbs, Cross, Tube and Tank, Holmes-Manley, Gyro, and DeFlorez are discussed separately as if they were different processes. Only the patent holders can state the true situation with respect to patent validity but there is some evidence that royalty collections in the future will be on a greatly reduced basis and the royalty will constitute pay for an advisory service rather than for patent rights.

Perhaps the best recent discussion of cracking is the series of 10 articles by C. R. Wagner which appeared in The Oil and Gas Journal between the dates of September 2 and December 9, 1943. The main book is "Conversion of Petroleum," 1940, by A. N. Sachanen, Reinhold Publishing Corp., New York. With respect to the patent situation, the publications of Universal Oil Products Co., 310 South Michigan Avenue, Chicago, entitled, "Library Bulletin of Abstracts," which has been appearing for over 20 years, and "The Cracking Art in . . ." which is published yearly, are perhaps the most comprehensive.

Pumping Liquids Under Vacuum

What sort of pump should be used for discharging asphaltic material at 700° F. from a vacuum flash chamber?—E.N.

Except for leaks of air at stuffing boxes, etc., and except for possible difficulty in starting the pump, the operations of a pump on a liquid at its boiling point and held at a low pressure (vacuum) is not different from the pumping of any other liquid at its boiling point. The main reason that difficulty is encountered with the pumping of hot liquids, particularly with respect to suction lift, is the fact that the vapor pressure of the liquid is so high (at or near its boiling point) that even a small amount of suction tends to make the material boil or vaporize; and no pump can operate effectively on a vapor if it is designed to operate on a liquid. Thus a good vacuum pump system must solve the following difficulties:

1. The pump suction must be large and free from constrictions such as turns, excessive length, small ports, etc., so that a maximum head or pressure will be available at the piston or impeller of the pump. This difficulty is sometimes met almost completely by immersing the impeller or gears of a gear pump in the liquid being pumped. Cooling of the suction line helps greatly in reducing the vapor-pressure of the liquid but is thermally inefficient.

2. Leakage of air into the suction line of the pump through the stuffing boxes of pump rods or shafts can be cured by immersion of the entire pump and motor into the liquid and the situation can be alleviated by the use of deep stuffing boxes and as slow a speed as possible with the particular type of pump. Finally an auxiliary or extra stuffing box can be used, so that some of the liquid from the discharge side of the pump can be confined between the two stuffing boxes.

3. Difficulty with starting can be avoided by the use of a discharge line connected to the vessel from which suction is taken. This discharge line can be opened until the pump is full of liquid and begins to function properly.

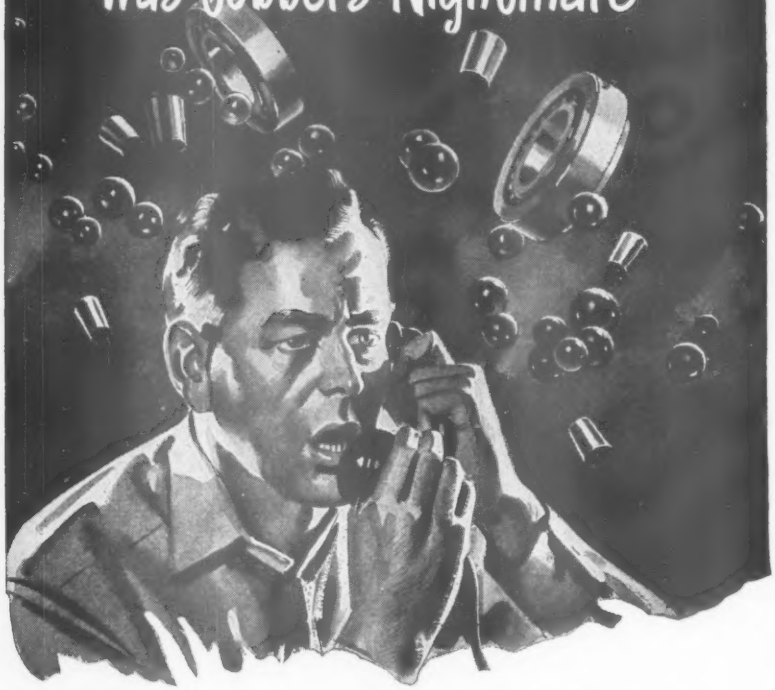
Centrifugal, rotary, and reciprocating steam pumps all are used for vacuum service. Centrifugal or rotary pumps, along with their motors, can be immersed in the liquid that is pumped but the high temperature of 700° F. would present difficulties.

Simplex reciprocating steam pumps are more suitable than duplex pumps because they are less subject to short stroking or vaporization in the cylinder. A steel liquid end is required because of the high temperature, extra deep stuffing boxes are helpful, short inlet ports and ones that are large are useful, and close clearances and an extra long stroke will further reduce the tendency to vaporization. Finally the pump should be purchased oversize so that it can operate slowly.

Theoretically the suction head required to suppress vaporization in the suction line and pump is only the head required to lift the intake valve and the head required to overcome the friction loss of the fluid moving in the suction line and through the ports. With an adequate unimpeded suction line there remains only the head to lift the valve. Except on extremely high-pressure heavy-construction pumps the weight of valve is so low that its weight per square inch of coverage is under 0.5 psi., which means that the suction head need be only 0.5 psi. For boiling petroleum oils this means a liquid head in feet of only 1.5 to 2 ft. Actually, heads of 8 ft. or more are advisable. Reference should also be made to Questions on Technology pages of July 29 and August 12, 1943.

XUM

Cost of Special Bearings was Jobber's Nightmare



Air Express solves his problem — for 5% of selling price!

Maybe *your* business isn't like this. Maybe it is. A lot of them are. Anyway, here's this jobber's story:

He stocks a standard line of precision bearings—a big investment. If he had to carry *all* special types and sizes, his investment would run into a nightmare of high-cost slow-turn "specials."

So in order to give 100% service, what does he do? Simply this. When a customer wants a "special", the jobber wires the manufacturer and has the order shipped Air Express. Same-day delivery is often made on orders placed early in day.

Cost of Air Express? Only 5% of his selling price — and on goods he doesn't have to carry!

Specify Air Express—a Good Business Buy

The inventory of any supplier in the nation is within a matter of hours of your business when you specify this fastest delivery service.

Shipments travel at a speed of three miles a minute between principal U. S. towns and cities, with cost including special pick-up and delivery. Same-day delivery between many airport towns and cities. Rapid air-rail service to 23,000 off-airline points in the United States. Direct service to scores of foreign countries.

AIR MILES	2 lbs.	5 lbs.	10 lbs.	25 lbs.
250	$1.04	$1.25	$1.57	$2.63
500	$1.11	$1.52	$2.19	$4.38
1000	$1.26	$2.19	$3.74	$8.75
2500	$1.68	$4.20	$8.40	$21.00

AIR EXPRESS

GETS THERE FIRST

Write Today for interesting "Map of Post-war Town" picturing advantages of Air Express to community, business and industry. Air Express Division, Railway Express Agency, 230 Park Avenue, New York 17. Or ask for it at any Airline or Express office.

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Tube Borium Keeps 'em digging

DULL IN 3 DAYS
STILL SHARP AFTER 30 DAYS
STOODY TUBE BORIUM* KEEPS DITCHER TEETH SHARP ...ELIMINATES FREQUENT SHUT-DOWNS FOR TOOTH CHANGES...CUTS REPLACEMENT COSTS UP TO 75%

The two ditcher teeth pictured above were used on the same machine and operated under identical conditions.

The unprotected tooth at the top had to be sharpened every three days and was too short for further service after six sharpenings.

But the Borium-protected tooth at the bottom operated for 40 days and wore only ½". It was simply resharpened in the forge, retipped with Tube Borium, and put back on the ditcher for another 40 days' service.

Before the tooth was finally worn out, it had operated a total of 120 days!

Tube Borium makes such savings possible because the deposits represent the ultimate in wear resistance and the ability to cut hard earth formations.

*Stoody Tube Borium is supplied in rods of 1/8", 3/16", 1/4" and 3/8" diameters and is available for either oxyacetylene or D.C. electric application. Prices and specifications are yours for the asking.

These tungsten carbide particles do not melt when tube is applied but are held in suspension in a mild steel matrix forming a deposit resembling coarse sandpaper.

Send for free booklet on TUBE BORIUM, showing sizes and styles of rods and recommended methods of application.

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STOODY HARD-FACING ALLOYS
Stop wear... Eliminate Repair

Chemical Treatment for Oil-Field Water For Injection Into the Ground

SUCCESSFUL handling of oil-field water for subsurface disposal through the open system depends upon correct chemical treatment which will bring down all the insoluble precipitates before filtration, allow as much of the floc as possible to settle, and thoroughly stabilize the water before it passes into the well. If the water is not properly treated and stabilized, precipitation of insoluble chemicals will continue after the water passes through the filter, and the water sand in the bottom of the intake well will be plugged up quickly. Scrapings from the walls of intake wells indicate that in many places the water is not stabilized and that much insoluble matter gets into the intake wells. The insoluble material scraped out of the pipe lines and intake wells consists of black iron sulfide, fine silica silt, in some places some colloidal silica, and in other places a soft gelatinous, rubber-like bacterial or fungus coating which has a strong fish-like odor and resembles paraffin dirt of the Gulf Coast region.

The black iron sulfide originates from the action of hydrogen sulfide upon soluble iron compounds in the water. Thus:

$$H_2S + Fe(HCO_3)_2 \rightarrow FeS + 2H_2O + CO_2$$

Hydrogen sulfide is derived from the reduction of sulfides by bacteria. Thus:

$$Na_2SO_4 + \text{bacteria} \rightarrow Na_2S + 2O_2$$

Oxygen is used up by the life processes of bacteria and the metallic sulfides react with water to form hydroxide and hydrogen sulfide. Thus:

$$Na_2S + 2H_2O \rightarrow H_2S + 2NaOH$$

The hydrogen sulfide then reacts with soluble iron to form insoluble black iron sulfide. The soluble iron in the water comes from the solution of iron in the filter tanks, filter plates, water pumps, and any unprotected pipe fittings, pipe lines, or tubing which the water goes through after passing the filters. To eliminate this black precipitate, therefore, two procedures are necessary: (1) The soluble iron from the water needs to be eliminated by complete oxidation and complete filtration, and sources of iron after filtration need to be removed by using wood, plastic, or concrete filter tanks in place of iron or lining the iron tanks with rubber or other insoluble protective coating. All pumps, pipe lines, and fittings need to be coated or made of nonmetallic material. (2) Bacteria need to be eliminated as much as possible.

Elimination of bacteria. — The sulfate-reducing bacteria, Vibrio thermodesulfuricans (Elion), that thrive in salt water are strictly anerobic. They will not live in air or oxygen and develop best at comparative high temperature, 80° to 150° F. At 125° F. they reduce sulfates during a 30-day period 98 per cent more than at 70° F. At 70° F. no reduction took place during a 20-day period, and at 125° F., only 10 per cent reduction during 10-day period. After a 10-day period, however, the per cent reduced increases rapidly. Life processes of bacteria require 1 to 3

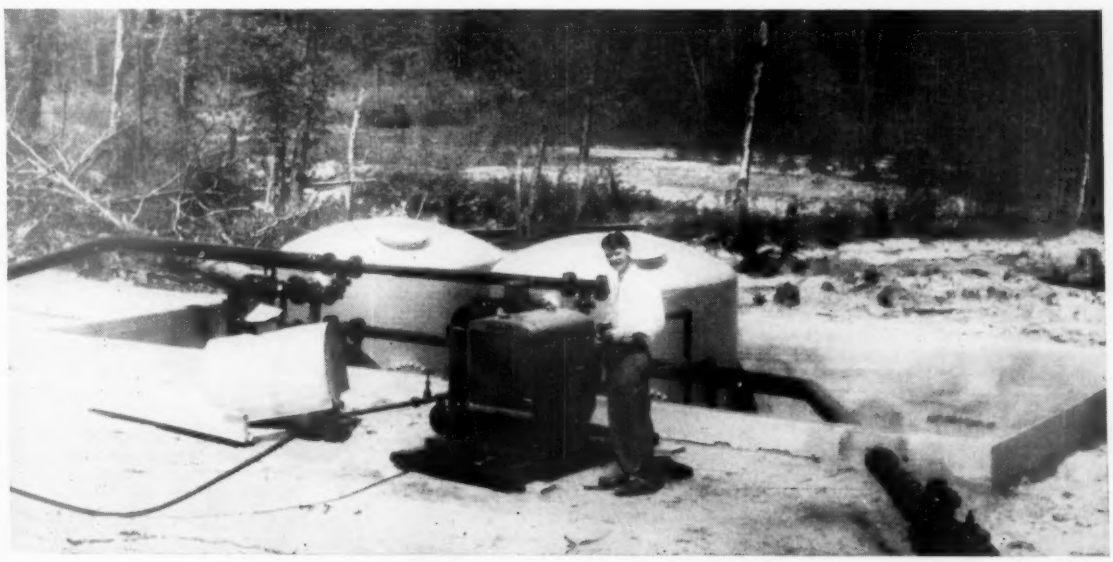

Fig. 1—Filters used in a salt-water injecting system, East Texas oil field. The water flows by gravity from the settling pits through the pipe shown at the right and is pumped from the filters to the injection well by the pump shown in the foreground

Series prepared by F. B. Plummer, professor, petroleum engineering school, University of Texas

weeks of time depending upon temperature to develop from concentrations found at the well head to concentrations required to produce appreciable amounts of H_2S. In East Texas the common treatment used to destroy sulfur-reducing bacteria is chlorine either generated by electrolysis of the salt water or by using liquid chlorine cylinders and diffusing the chlorine into the water through porous thimbles.

Chlorine treatment is excellent for pathogenic bacteria like Colon bacillus, but is not so effective for sulfate-reducing bacteria. Sulfate-reducing bacteria are adapted to strong chloride solutions, and small dosages of chlorine in large volumes of water react with water to form hypochlorous and hydrochloric acid with hydrogen sulfide and with organic matter. These reactions use up chlorine and result essentially only in increasing the chloride ions and the pH of the water. Strong dosages of free chlorine will kill sulfate-reducing bacteria, but small dosages where the chlorine is changed to acids and organic chloride compounds will not. Since it requires 1 week or more for harmful concentrations of bacteria to develop and since salt water passes through the heating systems and into the injection wells within 24 to 48 hours, one might think the reducing bacteria would not have time to develop. However, we think they develop mostly in stagnant places in the systems. They live in the bottoms of deep tanks where circulation is reduced to a minimum, particularly beneath precipitates of iron sulfide in spots wherever a reducing environment prevails and where hydrogen sulfide is present and oxygen absent. If a layer of iron sulfide accumulates even on a slab over which water is flowing, the bacteria swarm beneath and in the black layer. It is possible, however, to reduce the concentration of bacteria by taking advantage of a knowledge of their life habits as follows:

1. By thoroughly aerating and cleaning the systems often. This is best done by having a standby pit into which the water can be diverted and the pit bypassed and emptied. Or by having the system divided into two separate parts so that one part can be emptied, rinsed out into the pits holding the back wash water from the filter tanks, dried, and aerated without interrupting the flow of water through the other half of the system to the injection well.

2. Where and when climates permit, by cooling the water down to 70° F. Cooling may be accomplished by more aeration. The water may be aerated, not just once at the entrance to the disposal system, but between settling tanks as well. This is cheaply accomplished by building the pits separately on a hillside so that the floor of the first pit is above the surface of the second pit, and the bottom of the second above the surface of the third. In cool weather, pits having temperatures below 75° F. need not be emptied.

3. By injecting large dosages of formaldehyde, carbolic acid, or other cheap bacteriacides into the tanks or into the filter water once a week.

4. By spraying the bottoms and walls of tanks with bacteriacide. Even when they are cleaned and aerated some bacteria will remain in stagnant places for some time and need to be eliminated by spraying.

Reduction of silica content of injection water.—The large amount of silica found on the walls of injection wells is thought to be derived from two sources: (1) The jelly-like, colloidal silica is probably derived from solution of fine particles of sand and silt in filters and in salt water by alkaline water. (2) Silica is derived from the cement lining inside the tubing and water lines and from siliceous cement and asbestos used in construction of asbestos pipe. The cement in cement-lined pipes erodes away slowly upon action with strong salt water and furnishes fine particles high in silica which are carried along with the salt water and deposited in the injection well.

The insoluble silica in injection water may be reduced as follows: (1) By adjusting pH of the water so that it is neutral or slightly acid. (2) By using anthracite or other nonsilica filter media in place of silica sand. (3) By coating the interior of asbestos and cement-lined pipe and tubing with water insoluble coatings which will eliminate the slow disintegration of cement by salt water. (4) By rigging up the injection wells so that the face of the sand can be washed frequently and at low cost by circulation of fluid down through injection tubing and up through the annular space between tubing and casing.

The composition of insoluble deposits inside injection wells is shown in Table 1:

TABLE 1
Partial Analysis of Insoluble Residues Scraped From Pipe and Tubing, East Texas Oil Field

	(1)	(2)
$CaCO_3$	7.0	32.50
FeS	10.7	10.88
$MgCO_3$	2.8	1.50
Al_2O_3	5.8	3.95
SiO_2	69.2	12.12
Organic matter	4.5	38.71

(1) Scrapings from clean-out job, Shaw injection well, East Texas field. (2) Scrapings from pipe line between filter and injection well, Layne injection system, East Texas field.

Once formed in an injection well these insoluble residues, high in silica and organic matter, are difficult to remove. The calcium carbonate, aluminum, and iron compounds can be dissolved for the most part with acid. The silica compounds are insoluble and can be removed from pipes and tubing only by washing and swabbing.

Summary. — Successful water treatment in an open disposal system may be compared with the sanitation methods in a modern hospital: (1) sunlight, (2) plenty of fresh air, (3) cleanliness, (4) frequent applications of disinfectants, (5) frequent baths, and at times, swabbings with strong solvents, techniques which are much easier to carry out in a modern hospital than in the average oil field. These new methods, however, may be more applicable in oil fields when engineers become as conscious of the harmfulness of bacteria and as well trained in the techniques of aeration and disinfection as applied to oil fields, as doctors and nurses are in the sanitary techniques applied to hospitals. In oil fields, proper water treatment need not be unduly expensive or increase the cost of water injection. On the other hand, water sanitation will reduce the cost of underground water disposal.

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CENSORED

BUT THE FACTS ABOUT A MAJOR CEMENTING PROBLEM'S SOLUTION REMAIN!

[redacted] COMPANY

[redacted] Oklahoma

February 8, 1945

RHS - 284-14

In re: Larkin Cementrol Shoe

[redacted] Oil Corporation

[redacted] Okla.

Gentlemen:

Att: Mr. [redacted]

Your letter of February 2, 1945 inquires about our success in the use of the Larkin Cementrol Shoe.

Several years ago we conducted a survey of difficulties encountered in Kansas cable tool completions. The most outstanding finding was the fact that in one well out of three, cement was found below the shoe. The degree of cement invasion into the producing formation could not be accurately determined, but it was evident that in many cases wells had been permanently damaged by cement contamination of the potential producing horizon.

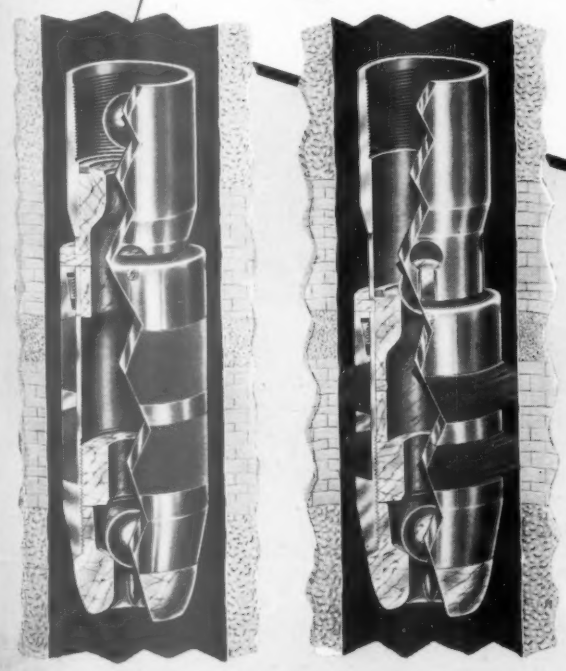
We contacted several manufacturers of oil field equipment and requested the development of packer type casing cementing shoe. The Larkin Cementrol Shoe is the result of approximately three years study, research, and development by that company on this specific problem.

As the shoe is now designed and offered to the industry, it should do the job for which it is intended. We have had complete success with its use in the wells in which it has been run. We are continuing to use the Cementrol Shoe in Kansas wells in which we cement casing on top of the producing zone. We have found that the shoe shortens the time required to clean up the formation when the plug is drilled as well as prevents the infiltration of cement into the formation during cementing operations.

Yours very truly,

[redacted]

[redacted]/r



Serves as a float shoe, bridge plug and packer. It is set by pump pressure.

The above is a letter from one important operator to another, citing the manner in which the Larkin CEMENTROL Shoe has solved his specific cementing problem.

As the industry becomes more familiar with this comparatively new, but thoroughly proved, cementing tool more and more uses for it become more apparent. It is being used to pack off inside of casing to protect exposed formations when cementing inside strings. It is being used also to prevent cement passing below the shoe in wells where considerable hole has been made past the formation to be produced, even though casing is set through such formation.

Examine this tool. You will probably have a use for it. Write for booklet giving complete information.

LARKIN

LARKIN PACKER CO., INC.

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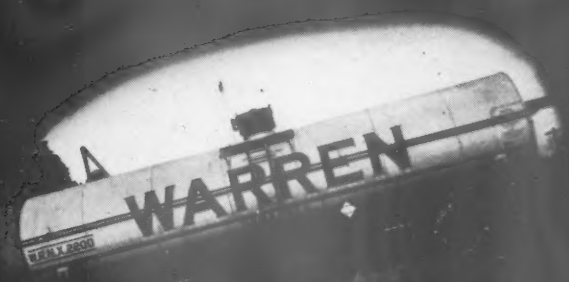

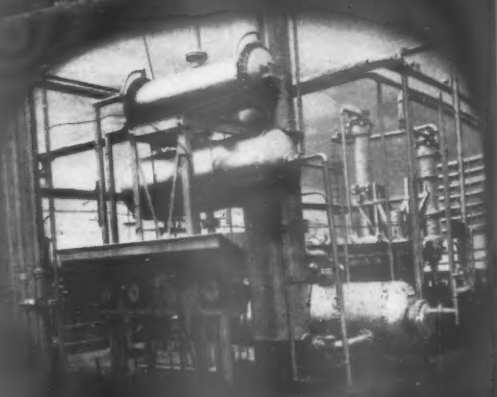

WARREN'S Stabilized NATURAL GASOLINE and Liquefied Petroleum Gases

To the refiners of the nation, it's Warren's Stabilized Natural Gasolines and Chemical Grade* Iso-Butane, Normal Butane and Iso-Pentane. To the Allied fighting forces of the world they are the "Fighting Vitamins"—the vital wartime elements—in 100 Octane Aviation Gasoline for the Flying Fortresses of the Allied Air Forces; the volatile, quick-starting, powerful motor fuel so essential to our motorized military equipment, industrial and transportation needs. Meanwhile, Warren is giving every consideration to future and postwar requirements for these war-proven products.

Chemical Grade
HYDROCARBONS
Iso-Pentane
Normal Butane
Iso-Butane
Propane

WARREN PETROLEUM CORPORATION

Manufacturers, Exporters and Marketers of Natural Gasoline and Liquefied Petroleum Gas

Tulsa, Oklahoma

Export Terminals: Corpus Christi, Port Arthur and Norsworthy, Houston, Texas, Lake Charles, La., and Marcus Hook, Pa.

XUM

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Tray Details—Downcomers And Weirs

FIG. 1 indicates the relationship between the liquid level and the height of the overflow dam or weir, slots of the bubble caps, and vapor risers. Table 1 shows the common sizes of downcomers and overflow weirs for various tower sizes. The liquid handled by the tray is the hot or internal reflux computed and discussed in Refinery Notebook No. 46 (June 16, 1945, page 143). It should not be confused with cold or external reflux. Downcomer areas are based on liquid (not froth) travels of 2 to 4 in. per second and the weir lengths are based on liquid heads or crests (not froth) of 1 to 1½ in. Towers that take 20 to 60 per cent overhead at internal reflux ratios of 2:1 to 16:1 and operating at atmospheric, vacuum or pressure conditions are covered by the ranges shown in Table 1.

TABLE 1—DOWNCOMERS (DOWNSPOUTS) AND OVERFLOW WEIRS FOR CONVENTIONAL BUBBLE TOWERS

Internal or hot reflux		Approx. tower	Downcomer sizes								Overflow weir, (in.)
			Area, sq. in.		Round, std. pipe		Height of segment (in.) Large towers		Small towers		
Lb. per hour	G.p.h.	dia. (ft.)	Min.	Desirable	Minimum	Desirable	Min.	Desirable	Min.	Desirable	
2,000	400	2′	6.3	12.7	1—3″	1—4″	...	...	...	...	2 up
5,000	1,000	2′-3′6″	16.0	32.0	1—4″	1—6″	1½	2½	2	3	3- 6
10,000	2,000	2′-5′	32.0	64.0	1—6″ or 2—4″	2—6″ or 4—4″	2	3½	3	4	6- 11
20,000	4,000	3′-7′	63.0	127.0	1—8″ or 2—6″	1—12″ or 2—8″	3	5	4	6½	12- 22
30,000	6,000	3′6″-8′	95.0	190.0	2—8″ or 3—6″	2—10″ or 4—8″	3¾	6	5	8	18- 33
40,000	8,000	4′-9′	127.0	254.0	3—8″ or 4—6″	2—12″ or 3—10″ or 5—8″	4	6½	6	9½	24- 44
60,000	12,000	5′-12′	190.0	380.0	2—10″ or 4—8″	3—12″ or 5—10″	5¼	9	7	11½	36- 67
80,000	16,000	5′6″-13′	254.0	508.0	3—10″ or 5—8″	.....	6	9½	8½	13½	48- 89
100,000	20,000	6′6″-15′	320.0	640.0	4—10″ or 6—8″	.....	7	11	9¼	15	57-111
120,000	24,000	7′-16′	380.0	760.0	5—10″ or 8—8″	.....	8	12	10	16½	73-133
160,000	32,000	8′ up	508.0	1,016.0	.....	.....	9	14	11¾	19	97-177

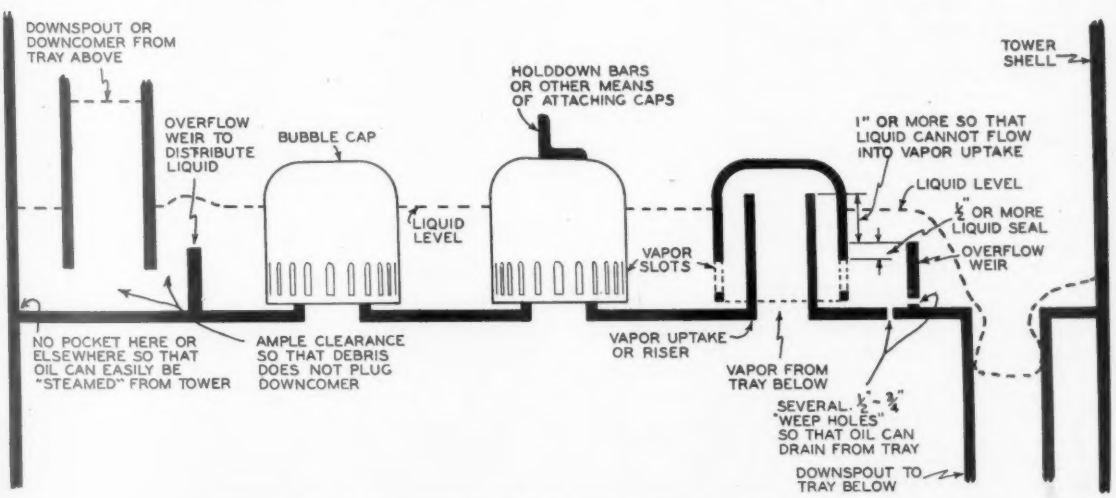
DOWNSPOUT OR DOWNCOMER FROM TRAY ABOVE
OVERFLOW WEIR TO DISTRIBUTE LIQUID
BUBBLE CAP
HOLDDOWN BARS OR OTHER MEANS OF ATTACHING CAPS
TOWER SHELL
1" OR MORE SO THAT LIQUID CANNOT FLOW INTO VAPOR UPTAKE
LIQUID LEVEL
½" OR MORE LIQUID SEAL
OVERFLOW WEIR
LIQUID LEVEL
VAPOR SLOTS
NO POCKET HERE OR ELSEWHERE SO THAT OIL CAN EASILY BE "STEAMED" FROM TOWER
AMPLE CLEARANCE SO THAT DEBRIS DOES NOT PLUG DOWNCOMER
VAPOR UPTAKE OR RISER
VAPOR FROM TRAY BELOW
SEVERAL ½" - ¾" "WEEP HOLES" SO THAT OIL CAN DRAIN FROM TRAY
DOWNSPOUT TO TRAY BELOW

Fig. 1—Fundamental features of a bubble-type tray or plate

No. 52 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

Natural Gas

Graham and Mistrot Are Named to PAW Posts

WASHINGTON.—James H. Graham, of Tulsa, has been named director, and Louis I. Mistrot, formerly of Louisiana, assistant director, of Petroleum Administration for War's natural-gas and natural-gasoline division in the southwestern area.

Graham had been assistant director of the division since June 1944. In his new post he succeeds Henry Brown, who resigned to return to private industry. Mistrot had been senior analyst of the division since June 1944.

As district petroleum engineer in charge of all petroleum engineering work in Southwest Texas for the Arkansas company, Mistrot supervised the drilling and completion of wells, compressor-plant installation and operation, and other types of work.

United Plans to Increase Carthage Field Facilities

WASHINGTON.—United Gas Pipe Line Co., which recently was authorized by Federal Power Commission to construct a 24-in. pipe line from the Carthage field, in Texas, to the Monroe field, in Louisiana (The Oil and Gas Journal, July 21, page 94), proposes also to install a field gathering system and a gasoline and dehydration plant in the Carthage field at an estimated initial cost of $3,704,366. Additional field gathering facilities are to be constructed during the second year of operation of the project at an estimated cost of $926,442.

United sells gas at retail directly to industrial consumers and at wholesale to distribution systems in the Monroe field area and along the route of its Sterlington-Jackson-Mobile pipe line, which extends east from Monroe Field to Jackson, Miss.; southeast to the Mobile, Ala., and Pensacola, Fla., areas. In addition, United, as a member of the so-called "productive group," sells gas at wholesale in the Monroe field to three major pipe-line companies—Mississippi River Fuel Corp., with principal markets in the St. Louis area; Memphis Natural Gas Co., whose most important market is Memphis, and Southern Natural Gas Co., which serves the Birmingham, Ala., and Atlanta and Macon, Ga., areas.

At the request of the Texas Railroad Commission, the attorney general's department in that state is preparing a motion for a rehearing before FPC of United's application for authority to build the Carthage-Monroe line. It is understood the motion will contend that public convenience and necessity do not justify the new pipe line and that Texas must conserve its natural resources for its own future development. The commission has been opposing all export applications.

Contract Disposes of Barnsdall Flare Gas

HOUSTON.—A contract has been entered into by Barnsdall Oil Co. and Tennessee Gas & Transmission Co. in accordance with which a minimum of 15,000,000 cu. ft. of vent and natural gas from Barnsdall wells in the Placedo field, Victoria County, will be taken daily by the other company. Barnsdall must deliver flare gas from at least 75 per cent of its wells, along with such additional flare gas as other operators in the field may arrange to process through Barnsdall's compression plant. The companies have been working on the plan to put the flare gas to some useful purpose since last October.

Tennessee will start taking gas as soon as Barnsdall can install the necessary gathering lines, compressor stations, and dehydration plants. Before the gas can be put into the high-pressure Tennessee main line, it must be stripped of all its liquid content, dehydrated, and brought up to line pressure.

Helium Playing "Sleuth" in Getting Oil and Gas Facts

WASHINGTON.—Helium now is described by Bureau of Mines as a "sleuth," unearthing previously unknown facts about underground migrations of oil and gas, which may be of vital importance.

The use of helium as a tracer involves injecting the inert gas into underground oil and natural-gas reservoirs through the well bores at one or more carefully selected locations and determining the presence of helium, if any, in the natural gas produced from adjacent wells.

The bureau's report, made by R. R. Sayers, director, covers extensive experiments in the development of Naval Petroleum Reserve 1, Elk Hills, Kern County, California. The work is being done in cooperation with the Office of Naval Petroleum and Oil Shale Reserves.

The Elk Hills project marks the first time that helium has been used as a tracer gas, and in the initial test the helium content of the natural gas compressed for injection into the well bore was limited to one-tenth of 1 per cent. In the next test, the helium content will be reduced about one-half. In later experiments various quantities of helium will be used to determine which concentration produces the best results. Probably one of the later tests will involve a short-time injection of pure helium to study the migration and diffusion of the concentrated gas.

Northern Natural to Build Recovery Plant in Kansas

OMAHA.—Plans for construction of a liquid-hydrocarbon recovery and gas-dehydration plant at Sublett, Kans., have been announced here by Northern Natural Gas Co. It is estimated the plant, with its equipment, will require expenditure of $1,000,000.

Output of Natural Gasoline Continues to Increase

WASHINGTON.—Daily average output of natural gasoline and allied products continued to rise in May, Bureau of Mines reports. The major increases were in East Texas, Louisiana Gulf, Texas and Oklahoma. Decreases were reported in the Appalachian region, central states and Panhandle. Total stocks rose 3,768,000 gal. during the month, with 186,312,000 on hand May 31.

Production and demand for natural gasoline and natural-gasoline mixtures at refineries was the most significant change in the light-products situation. Liquefied petroleum gases for both fuel and chemical uses showed gains.

PRODUCTION
(Thousands of gallons)

	May	April
Natural gasoline	187,851	177,082
Natural gasoline mixture	32,935	29,736
Raw condensate	36,563	35,661
Liquefied petroleum gases:		
Commercial butane-propane mixture	21,856	21,971
Normal butane	35,991	38,125
Propane	25,029	23,950
Other mixtures (L.P.G.)	17,414	13,829
Iso-butane	14,374	13,669
Iso-pentane	13,075	12,863
Finished gasoline and naphtha	19,423	18,870
Other products	3,124	3,076
Total	407,695	388,832

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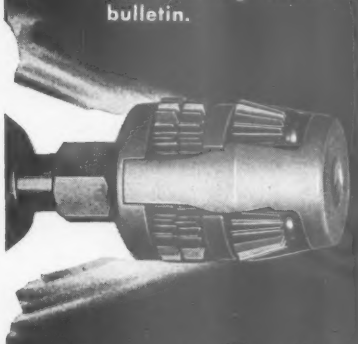
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REFINING

Indiana Standard to Make Bunker Fuel for Pacific

CASPER, Wyo.—Standard Oil Co. (Indiana) is preparing to run substantial quantities of Elk Basin and other similar crude oil at its Casper refinery to help in meeting the greatly increased demand for bunker fuel on the West Coast.

Since existing equipment was not suitable for running this type of fuel, a considerable expenditure is being made for supplementary installations. Production of bunker fuel oil for the Navy is expected to start on August 1, and deliveries will be made as soon thereafter as necessary storage can be built up. This operation will result in daily production of about 1,800 bbl. of bunker fuel oil.

Laboratory Triumphs Told In "848 Men—and You"

Facts of lively interest concerning petroleum developments of the war are presented in an attractive 46-page booklet, "848 Men—and You," prepared by Socony-Vacuum General Laboratories. These laboratories operate as two separate, but closely coordinated groups—the research and development laboratories, at Paulsboro, N. J., and the technical-service laboratories, in Brooklyn.

The booklet tells how Socony-Vacuum technicians — they include chemical, mechanical, and automotive engineers; organic and physical chemists; physicists and metallurgists—are devoting themselves to petroleum problems. What they have done in the fields of gasoline fuels, fuel oils, motor oils, industrial oils, lubricating grease, process products, chemicals and specialties is revealed as far as security restrictions permit.

PAW Takes Possession of Sinclair Butadiene Plant

HOUSTON.—The butadiene plant operated by Sinclair Rubber, Inc., was taken over July 19 by Petroleum Administration for War upon an executive order signed by President Truman in Potsdam, Germany. The action was taken because of a "real, substantial, and immediate emergency in the form of a threatened interruption of the butadiene plant as a result of a labor disturbance" the immediacy and extent of which "will not permit of further delay without irreparable damage to the war effort."

Deputy Petroleum Administrator Ralph K. Davies said in Washington that the agency's sole interest was to keep the plant in operation continuously so that there would be no interruption in meeting the demands of the fighting forces.

The butadiene plant is operated as a part of the Government's synthetic-rubber program. It is owned by Reconstruction Finance Corp. and leased to Sinclair. All of the workers are employes of Sinclair and not of RFC.

Production stopped at the plant

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early Thursday morning and crews were preparing for a complete shutdown when the PAW stepped in because of a strike threat by Local 227, International Oil Workers Union (C.I.O.).

H. L. Pelzer, general manager, continues in charge of the government operation of the plant.

The seizure was made at the hour when night and day shifts change. Full day crews reported for work and with government seizure the process of closing the plant down was stopped.

There was a production stoppage but no work stoppage, Pelzer said. About 3 days' production of rubber was lost because of the preparations made to close the plant.

The union voted Monday to call a strike because of a controversy over reopening negotiations of its contract and the union's demand for a union shop provision in the contract.

Better Tank-Car Situation Affords Suppliers Relief

CHICAGO. — Increased availability of tank cars for shipment of oil products in District 2, Petroleum Administration for War, has removed the necessity for suppliers to obtain specific approval of each proposed tank-car shipment of gasoline, kerosene, distillate or residual fuel.

Until October 16, unless suppliers are notified to the contrary, proposed movements of gasoline, kerosene, distillate and residual fuel by tank car in District 2 are approved under Petroleum Directive 65.

If this approval is not extended at the end of the period or if suppliers are notified that this approval is withdrawn, each subsequent tank-car shipment will require specific approval from PAW.

Esso Laboratories Cited for "Outstanding Services"

NEW YORK.—"Outstanding services in the production of war equipment" have won a fifth and special citation for employes of the Esso laboratories of Standard Oil Development Co., technical arm of Standard Oil Co. (New Jersey) and its affiliates.

Among the weapons to which the company contributed development and engineering services are the M-69 oil incendiary bomb, now being dropped daily on Japan; the M-1 oil-smoke generator, which screened the Rhine crossing; and an improved flame thrower which utilizes jellied gasoline.

The award adds a fourth white star to the company's original Army-Navy "E" flag of March 18, 1943, which was the first to be presented to a research and development organization in the oil industry. Each 6-month period since then the company has won a renewal citation. In his letter of notification to the 2,000 men and women employes, Undersecretary of War Robert P. Patterson said: "Your standard of practical patriotism is one of which you may well be proud."

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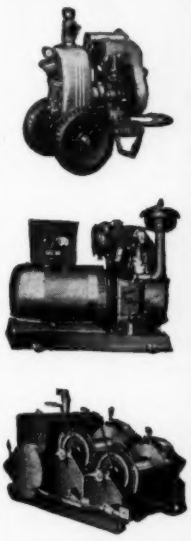
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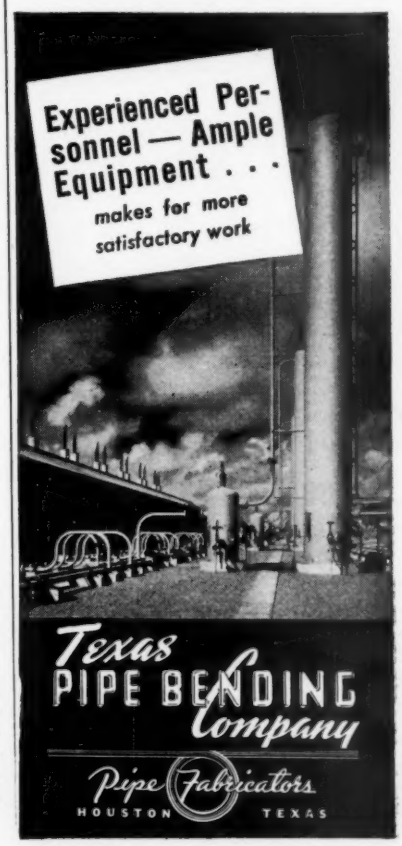

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HELIUM PLANT

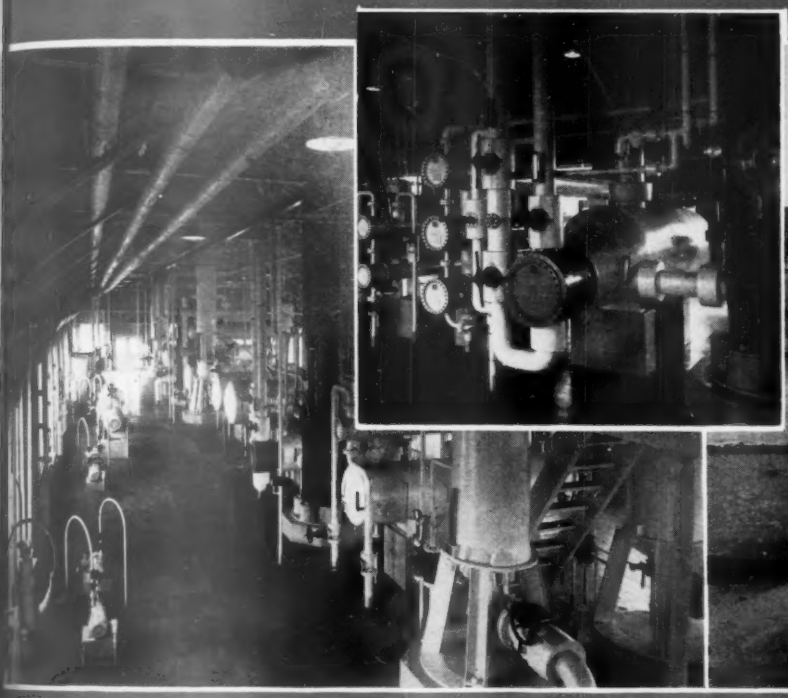
Completion of the United States Bureau of Mines NAVAJO Plant to recover pure helium from gas produced from the Rattlesnake Field again demonstrates the versatility of HUDSON in completing all phases of a gas processing project within its own integrated engineering and construction organization.

In addition to the gas processing units, other facilities including gathering lines from the helium bearing gas wells, a complete village for the operating personnel, water, gas and power distribution systems, a 35 mile fuel gas pipe line, and a 90 mile pure helium pipe line to the railroad at Gallup, New Mexico, were also constructed by Hudson as parts of this complete project.

This plant was constructed on the Navajo Indian Reservation near the village of Shiprock in the northwestern corner of New Mexico. Navajo Indians were extensively employed in the construction of the project.

Process equipment is housed in center buildings, and compressor and boiler houses are shown at right. Storage facilities for pure helium, impure helium, and nitrogen shown at right background.

designed and constructed by HUDSON



Interior views of one of the process equipment buildings. Fractionating columns extend through roof

Plant and domestic water is obtained from San Juan river

Additional helium storage was constructed at terminus of 90 mile helium pipe line at Gallup, New Mexico. Picture shows building housing facilities used in connection with loading helium at Gallup for rail shipment

General view showing housing facilities

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PIPE LINES

Big-Inch Crude-Oil Deliveries Increased

The Big-Inch (24-in.) pipe line delivered an average of 321,488 bbl. of crude oil daily to the New York-Philadelphia terminals during the week ended July 14, compared with 300,177 bbl. daily the previous week.

The Little Big-Inch (20-in.) pipe line delivered an average of 143,481 bbl. of petroleum products daily to the New York area during the week ended July 14, compared with 183,249 bbl. daily the previous week.

Tankers delivered 3,704,000 bbl. of crude oil and petroleum products to East Coast ports during the week ended July 14, 1945, compared with 3,170,000 bbl. during the previous week. The 3,704,000 bbl. consisted of 1,895,000 bbl. delivered from Gulf Coast points and 1,809,000 bbl. from Latin America.

Tank car shipments to the East Coast during the week averaged 322,136 bbl. daily compared with 315,588 bbl. the previous week.

Capacity of Gulf Coast Pipe Lines to Be Increased

AUSTIN.—With rising movement of oil to the Gulf Coast in prospect, several major pipe-line companies are revamping their lines in order to increase their capacity. One company is reported to be planning expenditure of approximately $1,000,000 on alteration of its system to permit batching of sweet and sour crudes from the Permian basin of West Texas and New Mexico. This project follows discoveries of deep sweet-crude pools in the basin.

Interstate Has 86 Per Cent Of Laying Work Finished

Interstate Oil Pipe Line Co.'s Mississippi-Baton Rouge system had pipe laying 86 per cent completed July 21, having finished 103 miles of the 121 miles of the original project. All of the 50 miles of 12 in. and 33 miles of 10 in. has been laid. Twenty miles of 8-in. pipe had been laid.

The terminal at Baton Rouge is 50 per cent completed. Status of other station construction is: Cranfield, 95 per cent; Gibson Landing, 98 per cent; tanks at Liberty, 86 per cent.

Construction of Liberty station, contracted by Ford, Bacon & Davis, started July 23. Filling of line will start August 1 at end of 10 in.

Laying of 36-mile 10 in. extension is scheduled to start October 1.

Pipe-Line Engineers Build Submerged Sea Line

The high degree of success achieved by a petroleum distribution company in the Pacific has resulted in a new method of laying submerged pipe line. The method is being recommended to engineer petroleum distribution units all over the Pacific.

Eight-inch steel line pipe was assembled into 600-ft. sections on the ramp, and the sections joined by electric arc welding. When 4,800 ft. of pipe had been welded into 600-ft. sections a bridle of heavy chain was welded to the seaward end of the first section for towing and for attaching a marker buoy. A timber "sled" was framed around the sea-

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ward end of the pipe and the line was ready for launching.

The toughest problem of all was solved with the help of the Navy. A net tender with a winch provided motive power for the launching. Two 12-ft. triangular range markers were erected on shore to guide the tender; in addition, blinker-light signal communication was maintained between ship and shore.

When all was ready, the ship was anchored on range. The winch line was run ashore and attached to the towing bridle. The first 600-ft. section of pipe was winched out until its shore end came opposite the sea end of the second section. The two sections were aligned with the aid of a winch-equipped 2½-ton truck and joined by two welders working simultaneously to speed the operation.

This procedure was repeated until the required 4,600 ft. of pipe was launched and floating just beneath the surface. During launching, marker buoys, improvised from large diameter pipe sections, were fixed to the line at 1,200-ft. intervals to mark its course.

When the line was fully launched the "sled" at the seaward end was loaded with concrete blocks to sink and anchor it. While a tractor held a slight strain on the pipe to maintain alignment, water was pumped into the pipe to sink the line and the job was done. The total elapsed working time was 8 hours and 25 minutes.

Government-Owned Lines Next O'Mahoney Topic

WASHINGTON. — Government-built pipe lines are scheduled to be the next subject of the Senate committee investigating petroleum resources, which has recessed to call of Senator O'Mahoney of Wyoming, chairman.

Hearings probably will not be resumed until after the summer recess of Congress.

FPC Hears Application for 116-Mile Natural-Gas Line

WASHINGTON. — Hearing was held here last week before the Federal Power Commission on a request by the Louisiana Natural Gas Co. for authority to build 116 miles of pipe line in Louisiana, Georgia, Alabama and Mississippi.

H. D. McHenry, counsel for the Birmingham (Ala.) concern, said the cost of the facilities is estimated at $3,771,760.

The natural gas is needed in the area served by the company.

Company Organized to Lay Hugoton-Detroit Gas Line

Organization of the Michigan-Wisconsin Pipe Line Co. to supply gas to consumers in Michigan, Wisconsin, Missouri and Iowa was announced in Detroit last week by William G. Woolfolk, chairman of the American Light & Traction Co.

Woolfolk said the new company, a Delaware corporation, would ask the Federal Power Commission immediately for a certificate of convenience and necessity for the building of a $70,000,000 natural-gas pipe line from the Hugoton gas field near Guymon, Okla., to Detroit.

The line, he said, would serve communities in the four-state area through companies affiliated with American Light & Traction and would be operated as a subsidiary of the Michigan Consolidated Gas Co.

Bradford Supply Co. Buys Buckeye Gathering Lines

BOWLING GREEN, Ohio.—Gathering lines of The Buckeye Pipe Line Co. in northwestern Ohio have been purchased by Bradford Supply Co., of Bradford, Pa. According to representatives of the Bradford concern, the Buckeye property includes approximately 400 miles of pipe line, ranging in diameter from 2 to 8 in.

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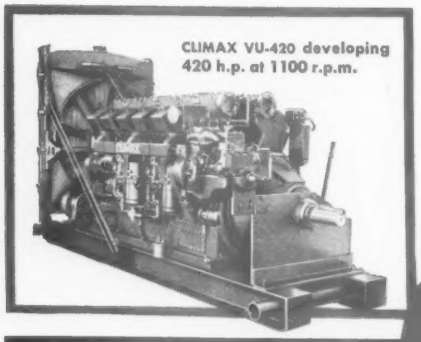

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Exploration and Drilling

Week's Highlights

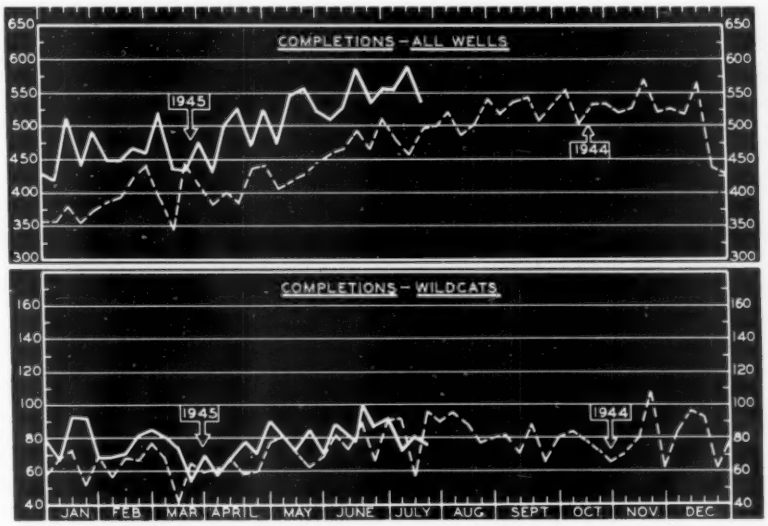
A RECENTLY reported discovery in coal research will probably result in a recheck of the present unsatisfactory status of the "carbon-ratio theory" and its application to the problem of determining in what areas it is definitely uneconomic to search for oil or gas. As a qualitative index, it is accepted by petroleum geologists that the ratio of fixed carbon to volatile matter in coals is a clue to the probability that either oil and gas, or gas only, or neither oil nor gas may be found in the sedimentary rocks in the same general area.

This theory hinges on the fact that when rocks have been subjected to heat and pressure, the coal formations are subjected to alteration, and if the coal is sufficiently altered, any oil or gas in the same area has been destroyed. The trouble came when attempts were made to apply this as a yardstick in a quantitative manner. It was not sufficiently accurate.

Now from research in the coal industry it is reported that:

"All bituminous coals yield about identical quantities of methane, when carbonized under similar conditions, regardless of their volatile-matter content. This demonstrates that coals not only contain a characteristic substance, which yields large quantities of methane, but that this substance is present in approximately equal amounts in them. Thus the methane number does not vary from coal to coal as do all other properties."

This immediately raises the question of whether or not unsuccess-



Solid line charts current weekly completions, service wells in Eastern area included

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 21, 1945

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1945				
	Comp.	Oil	Gas	Dry	Footage	1945	1944	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	34	17	0	*17	47,900	753	878	0	0	0	0	0	0	0	0	0	0
Pennsylvania	92	46	7	†39	136,213	2,154	2,092	0	0	0	0	0	0	0	0	0	0
West Virginia	18	0	16	2	80,352	445	477	0	0	0	0	0	0	0	0	0	0
Ohio	22	6	9	7	56,390	490	521	0	0	1	0	1	0	0	10	35	45
Indiana	6	1	0	5	12,634	105	118	0	0	0	1	1	4	0	0	15	19
Kentucky	8	4	0	4	17,187	251	373	1	0	0	2	3	16	0	2	24	42
Illinois	29	18	0	11	78,575	917	966	2	0	0	9	11	24	0	0	166	190
Michigan	13	5	0	8	37,163	417	343	0	0	0	5	5	5	0	2	144	151
Kansas	28	15	1	12	104,716	912	981	0	0	0	4	4	21	0	9	190	220
Neb., Mo., Iowa	0	0	0	0	0	12	16	0	0	0	0	0	0	0	0	9	9
Oklahoma	45	21	0	14	203,805	1,341	907	0	0	0	7	7	50	2	9	192	253
Texas	137	79	16	42	607,893	3,974	2,915	4	2	3	20	29	124	11	35	706	876
North Central	50	27	3	20	124,722	1,184	784	3	0	0	7	10	47	0	5	253	305
West	34	29	0	5	169,847	1,024	810	1	0	0	3	4	33	1	0	149	183
Panhandle	5	3	2	0	16,202	302	111	0	0	0	0	0	0	0	1	4	5
Eastern	11	2	6	3	67,136	185	187	0	1	1	1	3	5	5	1	51	62
Gulf Coast	30	15	5	10	194,759	907	623	0	1	2	7	10	28	4	22	151	205
Southwest	7	3	0	4	35,227	372	400	0	0	0	2	2	11	1	6	98	116
Louisiana	15	11	2	2	122,114	551	422	1	1	0	1	3	18	3	4	70	95
Northern	5	2	2	1	24,966	197	159	0	0	0	0	0	4	1	4	39	48
Southern	10	9	0	1	97,148	354	263	1	1	0	1	3	14	2	0	31	47
Arkansas	5	4	0	1	16,957	99	122	0	0	0	1	1	0	0	0	26	26
Mississippi	8	5	0	3	57,559	195	68	0	0	0	0	0	3	0	0	62	65
Southeastern States	2	0	0	2	6,980	32	20	0	0	0	2	2	0	0	1	21	22
Montana	10	7	1	2	22,427	175	171	0	0	0	0	0	7	0	0	12	19
Wyoming	10	7	0	3	42,436	110	87	0	0	0	3	3	9	0	0	21	30
Colorado-Utah	2	2	0	0	12,452	21	17	0	0	0	0	0	1	0	0	3	4
New Mexico	7	5	1	1	26,805	241	216	0	0	1	0	1	8	0	3	33	44
California	42	31	2	9	173,769	1,294	1,083	0	0	0	4	4	1	0	2	123	126
Total United States	533	294	55	184	1,864,327	14,489	12,793	8	3	5	59	75	291	16	77	1,852	2,236
Total previous week	591	315	69	207	1,880,079	13,946	12,274	5	3	4	70	82	283	13	72	1,793	2,161
Total July 22, 1944	505	251	45	209	1,632,299	12,793	8,764	13	0	1	83	97	226	19	68	1,706	2,019

Service wells included: *17, †36.

ful efforts to use the carbon-ratio theory in petroleum geology have been handicapped by the fact that the methane portion of the volatile matter was constant, regardless of the coal source. This might alter the ratio of the fixed carbon to the remainder of the volatile matter.

The answer will require a careful checking of laboratory techniques used in the coal research problem, and possible rechecking of many calculations made by carbon-ratio experimenters. The end result may be nothing new; it may raise only new questions. Just possibly, however, it might reveal a valuable new tool for petroleum geologists.

ILLINOIS

Wildcats Extend Clay City And Ellery South Pools

CENTRALIA.—The Clay City Consolidated field in Wayne County and Ellery South pool in Edwards County were extended by wildcat wells of relatively small initial production during the week in review. Only 29 wells were reported completed in the state during the week, 18 of which produced 2,428 bbl. of initial production. Eleven were dry holes, but 9 of these were wildcat failures.

A Herald pool outpost may extend that pool, as Homer Luttrell 1 Questell, NE NE NW 36-6s-9e, White County, made a drillstem test of Tar Springs sand at 2,296-2,304 ft., recovering in 1 hour 900 ft. of gas, 660 ft. of clean oil and 40 ft. of oil-cut mud.

In the Noble pool, Richland County, the best completion of the week in Illinois was Pure Oil Co. 3 R. M. Rusk-A, NE SE SE 19-3n-9e, which flowed 452 bbl. in 24 hours from McClosky lime at 2,981-87 ft. and 2,996-3,002 ft., which had been acidized.

Thirty-five new operations were reported in the state during the past week including 11 wildcats, as follows: Mohawk Drilling Co. 1 McDaniel, SE SE NW 15-1s-7e, Wayne County; Homer Luttrell 1 Larrimore, SW SW NE 25-9n-3e, Fayette County; Big Chief Drilling Co. 1 H. Giesiecke, SE SW NE 9-2n-5w, Clinton County; W. Wright 1 A. C. Heindselman, SW SE NW, 22-2n-14w, Richland County; Buell & Doran 1 Sloan, NW NW SE 1-2n-1e, Marion County; Magnolia Petroleum Co. 1 Labuda, NE NW NE 18-3s-1w, Washington County; Cherry & Kidd 1 M. Carson, NE NE SW 31-3s-3e, Jefferson County; Ben Nation 1 Young Bros., NW NW NE 31-4s-8e, White County; Pure Oil Co. 1 Church Property, SW NW SW 33-7n-10e, Jasper County; Homer Luttrell 1 Cole Gruber, NW SE SW 26-5n-3e, Fayette County; Texas Co. 1 J. H. Shafer-C, SW NW SW 26-3n-2w, Clinton County.

SUCCESSFUL ILLINOIS WILDCATS

Edwards County: Phillips Petroleum 1 Tait, SW SE SW 5-3s-10e, McClosky lime 3,247-52 ft. and 3,254-62 ft., TD 3,268 ft., PB to 3,263 ft. Pumped 24 bbl. oil and 23 bbl. water, through 36 perforations. Extends Ellery South pool.

Wayne County: Robinson & Puckett 1 W. F. Molt-B, SW SW NE 32-1n-8e, Aux Vases sand 3,017-27 ft., shot with 135 qt., TD 3,204 ft., pumped 18 bbl. oil, 24 bbl. water. Extends Clay City Consolidated field.

ILLINOIS WILDCAT FAILURES

Clay County: Bell Bros. 1 C. W. Crickman, NW SW SE 15-3n-7e, dry at 3,080 ft. Menard 2,224 ft., Cypress 2,639 ft., Benoist sand 2,803 ft., Aux Vases 2,870 ft., Ste. Genevieve 2,932 ft., McClosky 3,032 ft.

Edgar County: A. M. Myers 1 Tate, NW NE SE 11-12n-14w, dry at 512 ft.

Fayette County: Dale Hopkins 1 Bandelow, NW SW NE 25-7n-3e, dry at 2,054 ft. Tar Springs 1,524 ft., Cypress 1,810 ft., Benoist 1,955 ft., Aux Vases 2,009 ft.

Franklin County: H. R. Randall et al 1 C. C. Cyther, NW NE SW 13-5s-2e, dry at 2,779 ft. Lower Kincaid 1,745 ft., Cypress 2,485 ft., Aux Vases 2,739 ft. Lower O'Hara 2,750 ft.

Central Pipe Line 1 N. Sweet, SW SE SW 12-6s-3e, dry at 3,037 ft. Lower Kincaid 1,809 ft., Cypress 2,597 ft., Benoist 2,759 ft., Aux Vases 2,839 ft., McClosky 2,988 ft.

Hamilton County: Texas 1 Davis, SW NW NE 9-7s-5e, dry at 3,487 ft. Menard 2,394 ft., Cypress 2,940 ft., Benoist 3,102 ft., Aux Vases 3,234 ft., St. Louis 3,411 ft.

Jasper County: C. E. Hooker 1 Freeland, SW SW NW 15-8n-14w, dry at 691 ft.

Jefferson County: J. A. Lavender 1 et al 1 Casner O. & G., NW NW NW 33-1s-1e, dry at 2,412 ft. Menard 1,455 ft., Cypress 1,882 ft., Benoist sand 2,024 ft., Aux Vases 2,108 ft., McClosky 2,295 ft., St. Louis 2,403 ft.

Washington County: Magnolia 1 H. Rosener, NE SE SE 36-2s-4w, dry at 1,579 ft. Base of Pennsylvanian 748 ft., Benoist 1,235 ft., Aux Vases 1,359 ft., St. Louis 1,564 ft.

DAILY AVERAGE PRODUCTION FOR WEEK

	July 21 crude oil	Distillate, allied products	July PAW quota all oils	July 14 crude oil
Alabama	1,000	.....	500	950
Arkansas	79,750	5,000	85,000	80,200
California	951,500	60,900	1,012,900	949,750
Colorado	12,100	.....	12,000	12,350
Eastern	66,250	6,400	70,600	66,150
Florida	250	.....	.....	250
Illinois	204,400	12,000	212,000	200,600
Indiana	13,500	.....	13,000	12,700
Kansas	282,350	4,100	278,100	277,700
Kentucky	29,300	2,200	30,200	30,050
Louisiana	367,300	42,500	402,500	367,600
North Louisiana	70,400	.....	.....	70,700
South Louisiana	296,900	.....	.....	296,900
Michigan	45,300	700	47,700	53,900
Mississippi	52,300	.....	53,000	51,800
Montana	23,700	300	22,300	23,700
Nebraska	900	.....	1,000	900
New Mexico	103,050	5,000	110,000	103,050
Oklahoma	390,750	28,000	408,000	389,700
Texas	2,209,400	163,000	2,333,000	2,209,400
East Texas	379,500	.....	.....	379,500
East Central Texas	139,000	.....	.....	139,000
North Central Texas	152,300	.....	.....	152,300
Texas Panhandle	87,500	.....	.....	87,500
West Texas	521,400	.....	.....	521,400
Southwest Texas	360,750	.....	.....	360,750
Texas Gulf Coast	568,950	.....	.....	568,950
Wyoming	106,500	3,100	121,300	106,200
Total United States	4,939,600	333,200	5,213,100	4,936,950
Change from previous week	up 2,650			
Total production January 1-July 21, 1945				971,533,200 bbl.
Same period last year				906,141,400 bbl.

SOUTHWEST TEXAS

Continental Completes Albert West Discovery

CORPUS CHRISTI.—Discovery well for Albert West field, Live Oak County, has been completed by Continental Oil Co. The discovery, 2-A Albert West, is 1½ miles southeast of Kittie in M. Cronican Survey, and flowed a potential of 103 bbl. per day through a 9/64-in. choke. Tubing pressure was 1,700 lb., casing pressure 2,200 lb., 4 per cent salt water. Gas-oil ratio is 5,100 to 1. Production is through 20 perforations at 6,715-18 ft.

A new producing sand in the top of the Vicksburg has been opened by Arkansas Fuel Oil 2-A Etta Terrell, in the Gaffney field of Victoria County. Drilled to a total depth of 5,653 ft., it was completed as a gas well, flowing an estimated 11,000,000 cu. ft. of gas per day, open flow, through 53 perforations at 5,312-23 ft. The 5½-in. casing was set at 5,636 ft.

Dee Davenport 3-A Annie Graves Dolph et al, a wildcat about 2½ miles southwest of the Ezzell field, in Section 54, C. C. Shumway subdivision, McMullen County, was dry at 1,590 ft.

Of the 23 new locations reported this week only 3 were wildcats, one each in Bee, Brooks, and Victoria counties. Stratton and Bruni fields led with three lotions each. There were 25 completions, 2 opening new gas pays and one each in San Patricio and Victoria counties, with 4 dry.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

San Patricio County: New gas pay, Maedgen field—Republic Natural Gas Co. 1 G. A. Person, J. J. Summers Sur., 1 mile south of Mathis, TD 5,225 ft.; perforations 5,179-84 ft.; PT estimated 10,000,000 cu. ft. gas per day, open flow; shut-in pressure 2,300 lb.

Victoria County: New gas pay, Gaffney field—Arkansas Fuel Oil Co. 2-A Erra Terrell, Miguel Menchaca Gr., TD 5,653 ft.; perforations 5,312-23 ft. in Vicksburg; PT estimated 11,000,000 cu. ft. gas per day, open flow; tubing pressure 1,225 lb., casing pressure 2,200 lb.

SOUTHWEST TEXAS WILDCAT FAILURES

De Witt County: Shell Oil Co., Inc. 1 J. F. Garrett, John R. Foster Sur., Abst. 189, 2½ miles south of Terryville, dry at 8,850 ft.

Duval County: Republic Natural Gas Co. 1 C. K. Gravis, Sur. 254, 8 miles

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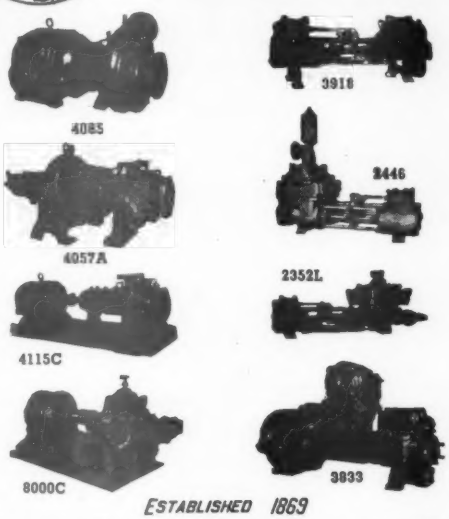

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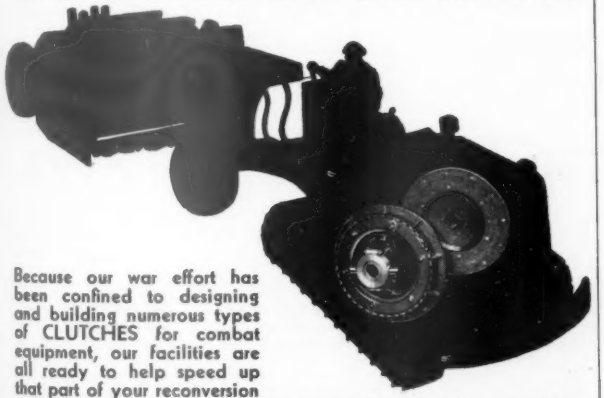

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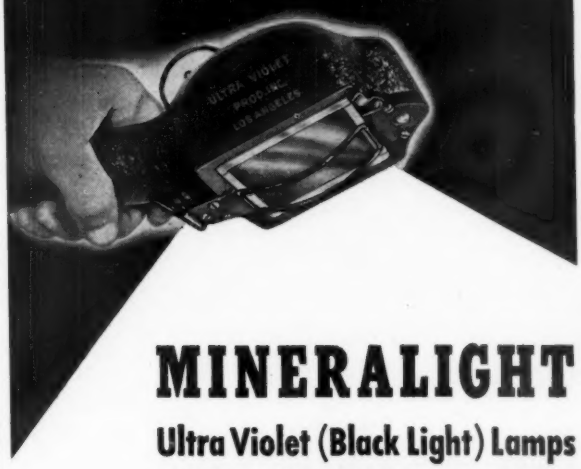

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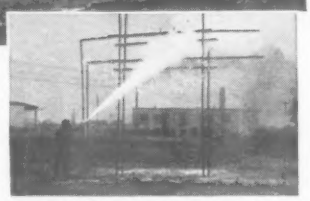

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southwest of San Diego, dry at 5,417 ft.

Jim Hogg County: Dulup Oil Co. 2 San Juan Ramirez et al, Sur. 271, Blk. 10, dry at 2,516 ft.

Victoria County: Pool & Johnston 1 W. R. Handley Estate, James Gray Sur., Abst. 171, 3½ miles northeast of Guadalupe, dry at 5,688 ft.

APPALACHIAN FIELD

Another 10,000,000-Cu. Ft. Gasser for Elk-Poca

PITTSBURGH.—In Elk district, Kanawha County, West Virginia, United Fuel Gas Co. completed another 10,00,000-cu. ft. gas well east of the southern tip of the Elk-Poca Oriskany gas field. It is No. 5,592 United Fuel Gas Co. The Corniferous lime was topped at 5,274 ft., Oriskany 5,385 ft., total depth 5,405 ft., elevation 1,138 ft. This is the third well of that size since the Gebhart discovery.

In Loudon district, Kanawha County, Owens Libby Owens Gas Department drilled through the Oriskany sand in a test on R. E. Eskins farm with a gage of 27,000 cu. ft. gas before shot. It will be shot. In Wyoming County, Hope Natural Gas Co. completed No. 8,959 N. R. & P. Consolidated Coal Co. in Baileysville district, with an open flow of 5,097,000 cu. ft. gas.

Wildcat progress is as follows: Tucker County, Ohio Oil Co. 1 Kuykendall is drilling at 6,022 ft. with rotary; Greenbrier County, Williamsburg district, Ohio Oil Co. 1 Gauley Coal Co. at 1,285 ft. in red lime; Webster County, Hacker Springs district, Tri-State Oil & Gas Co. 1 Hoover & Davis at 1,285 ft. in lime; Preston County, Portland district, Wm. E. Snee et al 2 Harry Sisler at 2,925 ft. New locations during the past week totaled four of which one was in West Union district, Doddridge County, two in Gilmer County, Center and DeKalb districts, and one in Elk District, Kanawha County.

Completions in southwest Pennsylvania were small and the deep tests drilling are not yet at a critical depth. New locations totaled two, both in Armstrong County and in Cowanshannock and Plum Creek townships.

In southeast Ohio, Ohio Oil Co. completed the test on Mattie M. Kutz farm in Section 14, Knox Township, Columbiana County, and after shot it had 3,000,000 cu. ft. gas from the Oriskany sand. This makes a total of five good gas wells in the new field.

CANADIAN FIELDS

New Completion Reported In Turner Valley Pool

CHATHAM.—In north central Turner Valley, Royalite Oil 80, LSD 10, 2-20-3w5, finished with Madison at 7,480-7,993 ft. and initial production of 354 bbl. daily. Royalite 85 is a new location in same section.

Steveville.—In the Steveville-Princess area, eastern Alberta, Princess-C.P.R. 58-22-A, LSD 14, 22-20-12w4, at total depth of 3,977 ft. was put on production by gas lift, and is averaging 65 bbl. 35-gravity oil daily. Peerless 1, LSD 4, 18-20-11w4, total depth 3,184 ft., is producing with gas lift, with output ungaged. Location is east and south of the discovery area. Empire-Pacific 1, LSD 1, 27-19-12w4, south of discovery with 200 bbl. and 75,000 cu. ft.

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gas indicated by early drill-stem tests has set 7-in. above the Devonian at 3,281 ft. and is swabbing.

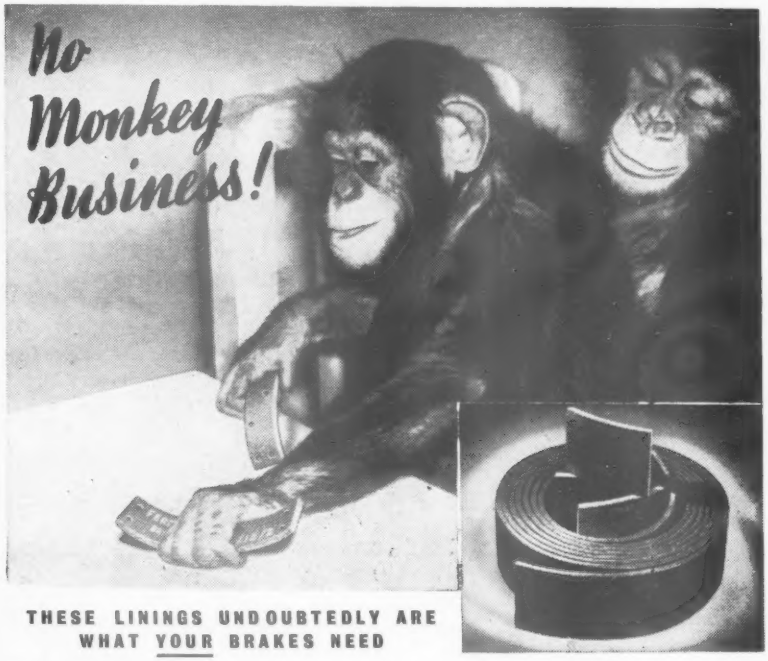
Conrad.—In the Conrad field, southern Alberta, Conrad-Province, 17-5-A, LSD 16, 5-6-15w4, finished at 3,124 ft., is producing, with initial output unreported. Production is from the Ellis. Conrad-Province 33-5-A, LSD 7, 5-6-15w4, is waiting for pump at total depth of 2,962 ft. Three new California-Standard tests are starting.

Edgerton. — In the Edgerton district, eastern Alberta, Edgerton Oils 2, LSD 3, 20-43-4w4, is testing oil shows in the Devonian limestone at 2,689 ft. and trying to shut off water from an overlying sand. A second test is being started.

Rainy Hills.—Rainy Hills 1, SW¼ 34-19-10w4, an old well deepening from 3,500 ft. to test a possible southeast extension of Devonian limestone production in the Steveville field, is being abandoned at 4,095 ft.

Tar Sands. — Shareholders of Abasand Oils, Ltd., following withdrawal of the Dominian Government participation in the enterprise of producing petroleum products from the Northern Alberta tar sands, have decided to rebuild the separation unit. Capacity will be stepped up approximately 400 bbl. daily to a total of around 1,000 bbl. The refinery, which was unchanged, has 1,200-bbl. capacity.

Nova Scotia.—In the province of Nova Scotia, Sun Oil Co. of Philadelphia is starting a deep test in the Nappan area of Cumberland County at the head of the Bay of Fundy. The test, spudded at the end of May, is planned to 15,000 ft. if necessary. Lion Oil Refining Co. had drilled to about 7,000 ft. in the Mabou district of Cape Breton, but is shut down owing to difficulty in securing materials. Surveys have been made in Hants County, and a Nova Scotia company last year started drilling at Kennetcook.



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MICHIGAN

Deep River Allowable to Be Cut to 50 Bbl. Daily Per Well

SAGINAW.—Initial potential totaling 320 bbl. daily was supplied last week by 5 new producers among 13 completions in Michigan oil fields. Eleven new locations were listed. Five of the nine dry holes were wildcats, two in Midland County and including a test to 4,460 ft.

Daily production in the state has increased slightly, the June total being estimated at 1,475,000 bbl., an average of 49,164 bbl. a day from 3,501 producing wells.

Because bottom-hole pressure decrease has been pronounced, the State Oil Advisory Board has recommended a reduction in the production allowable for wells in the Deep River field of Arenac County to 100 bbl. a well per day; currently the top output is 150 bbl.

New locations are scheduled, two each in Arenac and Bay counties, one each in Isabella, Missaukee, Osceola, Van Buren, Allegan, Montcalm and Mecosta.

MICHIGAN WILDCAT FAILURES

Clare County, Hamilton Township: Sun Oil Co. 1 McClure, Bates et al, C NW 9-19n-3w, dry, TD 1,448 ft.

Gratiot County, Elba Township: National Associated Petroleum Co. 1 R. Barnhart, SW SW NW 5-9n-1w, dry in Dundee, TD 3,005 ft.

Midland County, Larkin Township: Rex Oil & Gas Co. 1 Merle H. Crawford, SW SW SE 20-15n-2e, dry in Dundee, TD 3,841 ft.

Midland Township: Ashby Drilling Co. 1 T. E. McCann, NE NE NE 33-14n-2e, dry, TD 4,460 ft.

Ottawa County, Zeeland Township: P. K. Degenther 1 Jennie Boerman, NW SW NW 35-5n-14w, TD 1,600 ft.

EASTERN TEXAS

Fourth Well in Merigale Pool Flowing Wild

DALLAS. — Bobby Manziel 1-A Shamburger, fourth well to be drilled in the Merigale pool of northern Wood County, set 5½-in. casing at 4,760 ft., drilled plug and started blowing out and flowing wild. The first two wells in the field were small pumpers. The third well flowed better than 300 bbl. in 24 hours. 1-A Shamburger promises to better this.

Humble Oil & Refining 1 Maness, J. M. Musquez Survey, wildcat 8 miles southeast of Rusk, Cherokee County, was drilling below 9,289 ft. in hard sand and shale. Humble 1 Leone Plantation, Navarro Crossing pool of northwest Houston County, topped the Woodbine at 5,823 ft., drilled to 6,708 ft. and was perforating for completion.

Tex Harvey Oil Co. will drill a wildcat 1 mile north of Angus, Navarro County. It is 1 Edens, Block 12, M. Shire Survey. It will test the Woodbine. J. L. Collins 1 R. R. Greenlee, Robert Cardine Survey, Travis Peak wildcat 4 miles southeast of Eureka, Navarro County, topped the Woodbine at 3,440 ft. and the Goodland at 4,848 ft. It was drilling below 5,350 ft.

Lone Star Production Co. and Shell Oil Co. 1 Tandy in the Buffalo area of Leon County, was drilling below 10,510 ft. in hard sand unchanged.

The Carthage field, Panola County, led this district in field completions with

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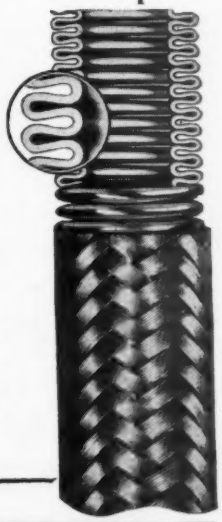

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three. The Carthage field and the Bethany fields, Panola County, each reported two new field locations.

EASTERN TEXAS SUCCESSFUL WILDCATS

Freestone County: New gas pay: Texas 1 Sneed, B. Green Sur., 3,600 ft. S and slightly W 1 McKnight, Travis Peak 7,920 ft., plugged back to 4,218 ft., Woodbine 4,196 ft., flowed 27,000,000 cu. ft. gas day with 2 bbl. 54° gravity distillate per mil. cu. ft. gas through 12/64-in. choke, perf. 4,198-4,207 ft. Woodbine, TD 8,292 ft.

Rusk County: New gas pool—H. C. Owens 1 J. H. Rousseau, Robt. Gilkerson Sur., 4½ mi. NE Minden, elev. 595 ft., Travis Peak 7,340 ft., IP 1,650,000 cu. ft. gas day with 25 to 30 bbl. distillate per mil. cu. ft. gas, perf. 7,382-89 ft., plugged back to 7,429 ft., TD 7,512 ft.

EASTERN TEXAS WILDCAT FAILURES

Wood County: Algord Oil and Homer Snowden 1 J. R. Jordan, J. Rodden Sur., 2 mi. NW Pine Hills, elev. 495 ft., Pecan Gap 3,850 ft., Austin chalk 6,648 ft., dry, TD 7,515 ft.

SOUTH LOUISIANA

Wilcox Production Is Discovered at Flatwoods

NEW ORLEANS.—A new oil pool at Flatwoods in Rapides Parish has been opened by Louisiana Land & Exploration Co. 2-A J. A. Bentley, Jr., Tract 2, 36-5n-5w, pumping 48 bbl. of 48-gravity oil per day. Production is from the lower Wilcox which was perforated from 6,488-94 ft. Total depth is 7,288 ft. and top of Wilcox was 3,707 ft.

In the South St. Gabriel area of Iberville Parish, Noble & Baker 1 W. E. Caldwell, discovery well, 52-9s-2e, is cleaning through a ⅛-in. choke through 114 perforations at 9,190-9,211 ft. Although gage is not yet available, it is reported showing for an excellent producer. Total depth of the hole is 9,305 ft. with 7-in. casing set on bottom. Sand showing oil was encountered at 8,798-8,810 ft. Tubing pressure was 2,150 lb., and casing pressure 2,300 lb. The well was still making about 10 per cent wash water. Gravity of the oil while cleaning was 37°. This well, which is more than a mile south of St. Gabriel producers, and is across a fault from that field.

A new deep sand at Lake Barre field in Terrebonne Parish was found by The Texas Co. 44 State-Lake Barre, 19-21s-20e. Drilled to a total depth of 13,259 ft., the deep sand was perforated at 11,772-88 ft. It flowed 41 bbl. of 54-gravity condensate per day through a ⅛-in. choke, no water, with tubing pressure of 4,050 lb., and gas-oil ratio 46,000 to 1. The 7-in. casing was set to 11,250 ft.

Of the 10 new locations for this week only 1 is a wildcat, being in Calcasieu Parish. The remaining locations are one each in Acadia, Beauregard, Calcasieu, East Baton Rouge, Iberia, Jefferson Davis, St. Martin, with two in St. Mary Parish. Of the 10 completions reported, 9 are producers, 1 of which opened a new pool in Rapides, and 1 a new condensate pay in Terrebonne Parish.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Rapides Parish: New oil pool, Flatwoods—Louisiana Land & Exploration Co. 2-A J. A. Bently, Jr., Tract 2, Center NE/4 NW/4 36-5n-5w, top Wilcox 3,707 ft., total depth 7,285 ft., perforations 6,488-94 ft., PT 48 bbl. per day, pumping, gravity 48°, some water.

Terrebonne Parish: New condensate pay, Lake Barre field—The Texas Co. 44 State-Lake Barre, 19-21s-20e, TD 13,259 ft., perforations 11,772-788 ft., PT 41 bbl. condensate per day through ⅛-in. choke, gas-oil ratio 46,000 to 1, tubing pressure 4,050 lb., gravity 54°, no water.

SOUTH LOUISIANA WILDCAT FAILURES

St. Martin Parish: Yegua Corp. 1 Oliviere & Burdin, 48-7s-6e, dry at 10,924 ft.

TEXAS GULF COAST

Austin County Wildcat Credited With Oil Show

HOUSTON.—Two miles southeast of New Ulm in Austin County, Sinclair Prairie Oil Co. 1 W. A. Schweke, a wildcat, in James Tylee Survey, is credited with good oil shows at 9,155-68 ft. This test is now drilling below 9,610 ft.

Rowan & Hope and Newman Bros. 1 Hollingsworth Ranch, a wildcat 12 miles north of Edna, in the Eli Mercer Survey of Jackson County, was dry at total depth of 4,762 ft.

S. A. Brewster and W. O. Bartle 1 Olive J. Park, wildcat in H&TC Survey, 6 miles north of Cleveland in San Jacinto County, is reported dry at 9,017 ft. Electrical log was run to bottom. Shows in the Cockfield previously reported around 5,290 ft., did not indicate commercial possibilities.

Fifteen new locations were reported this week, 3 of which are wildcats, in Barzoria, Harris and Liberty counties. Fannett and Stowell fields led with three locations each. Of the 12 completions 6 were wildcats, one a condensate discovery in Colorado County, the other five dry, one each in Fayette, Harris, Jack-

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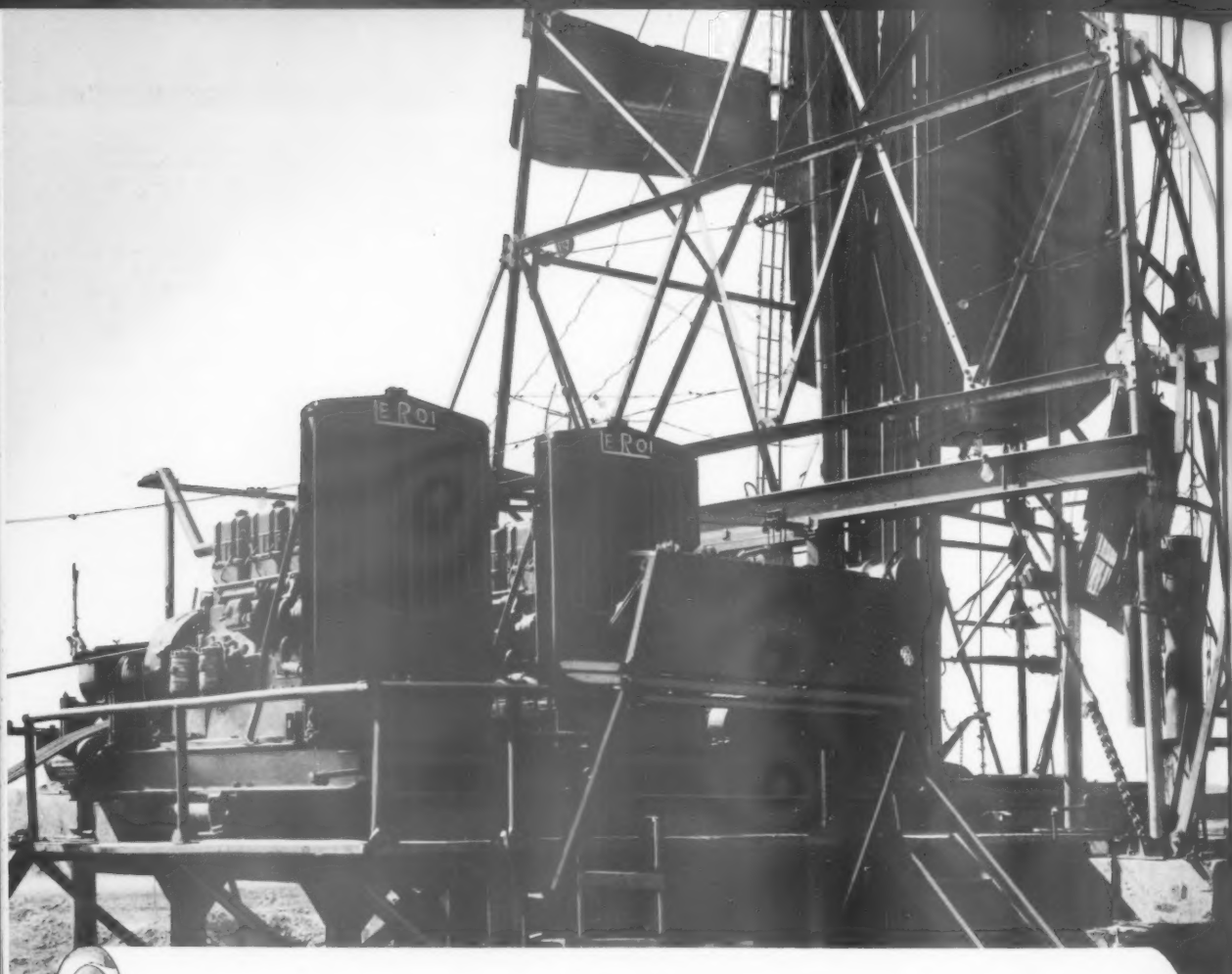

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son, Lavaca and San Jacinto counties. There were five producers completed in proven fields, one each in Brazoria, Colorado, Harris, Jackson, and Liberty counties.

UPPER GULF COAST SUCCESSFUL WILDCATS

Colorado County: Condensate discovery—Superior Oil Co. of California 2-A Mrs. Matilda Tait, Patrick O'Daugherty Survey, Abstract 167, ½ mile northwest of Altair, top sand 8,256-8,316 ft. Wilcox; TD 9,286 ft.; perforations, 73 holes, 8,256-68 ft.; PT 432 bbl. day through 16/64-in. choke; gas-oil ratio 3,060 to 1; tubing pressure 1,900 lb.; gravity 57°, no water.

UPPER GULF COAST WILDCAT FAILURES

Fayette County: Clark & Cowden 1 J. B. Paulus Estate, T. H. Harris Sur., Abst. 208, 4 miles northwest of Flatonia, dry at 2,515 ft.

Harris County: Houston Oil Co. of Texas 1 H. D. Taylor et al, HT&B Sur. 5, Abst. 469, 3½ miles southwest of Barker, dry at 8,005 ft.

Jackson County: Woodie B. Craig 1 L. R. Hollingsworth, Eli Mercer Sur., Abst. 54, 9½ miles north of Edna, dry at 4,757 ft.

Lavaca County: Stewart Boyle 1 R. Pohler, Jas. Callahan Sur., 7 miles southeast of Moulton, dry at 6,511 ft.

San Jacinto County: S. A. Brewster and W. O. Bartle 1 Olive J. Park, H&TC Sur., 6 miles north of Cleveland, dry at 9,017 ft.

CALIFORNIA

McKittrick Deep Pay Attracts New Drilling

LOS ANGELES.—Standard Oil Co. of California and Union Oil Co. have started new wells in the Cymric section of the McKittrick field where the latter recently completed a deep flowing-well discovery. Union's deep well has been given an initial of 1,440 bbl. On the basis of this completion the Cymric pool can be given an additional reserve of probably 1,000,000 bbl. even though the newly discovered sand is relatively thin, approximating 25 ft. Topography is flat and only about 200 acres have been productive in the overlying Pliocene.

The Edison field of Kern County has received aggressive deep-zone exploration recently. The program involves development of fractured schist on top of the schist basement. H. H. Magee made a formation test of 3 Daugherty in fractured schist at 2,570-2,626 ft., resulting in flow of 1,500 bbl. daily. Top of the fractured schist was 2,440 ft., giving the well about 186 ft. of fractured basement from which to produce. This schist production is somewhat comparable with production conditions in the Playa Del Rey field of Los Angeles basin although in the latter field production is also secured from the nodular shale. There has been a marked tendency to explore basement rocks even in the Santa Maria Valley where operators have been securing some production from the Knoxville-Franciscan basement.

General Petroleum Corp. will probably complete a flowing well in the Paloma field within the next few days. Its 36-28 Benco, an outpost well, flowed at a daily rate of 600 bbl. from four holes which were shot in the 7-in. water string in order to make a water shut-off test. The 7-in. has been landed at 11,290 ft. and top of the Paloma oil sand has been placed at 10,779 ft. When completed this well will extend the limits of production and add about 200 productive acres to the field. In accordance with past policy, this well will become a part of the unit plan for the field and increase General Petroleum's participating interest.

There was a substantial increase in first reports this week but this can be attributed to the staking of 20 new locations by Union Pacific Railroad in the Wilmington field. It is customary for operators in this field to make locations for several months ahead and Union Pacific's 20 new locations covers an extended program. San Joaquin Valley again headed the location list with 28 followed by Los Angeles Basin with 27, the latter including Union Pacific's group. Two wildcat locations were announced and Shell will soon start work on a new wildcat in the Covina district. Amerada will soon drill a gas test in the Dixon area of Solano County in Section 35-6n-2e on the Wineman lease.

SUCCESSFUL DEEP-ZONE WILDCAT COMPLETION IN CALIFORNIA

Kern County, Cymric-McKittrick: Union 45-26 Anderson, 26-29s-21e, flowed 1,440 bbl. 33.1-gravity, clean, 850,000 cu. ft. gas, 32/64-in. bean, pressures 460/550 lb., TD 3,610 ft., perf. 3,580-610 ft., opens up new productive zone believed located above Carneros, in upper Miocene.

CALIFORNIA WILDCAT FAILURES

Kern County, Dyer Creek: Rothschild Oil 1 Smith, 11-26s-27e, bottomed in Vedder sand of Miocene age, tested wet on production test, TD 2,357 ft.

Mountain View: Continental 1 Porter, 28-30s-29e, bottomed in basement,

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San Benito County, Paicines: Panoche Petroleum Co. 2 Panoche, 24-16s-10e, bottomed in gray sand, no showings, test inconclusive, TD 160 ft.

Tulare County, Pixley: Jergins Oil Co. 1 Cloer, 23-22s-26e, bottomed in slate, Olcese 2,305 ft., no showings of importance, TD 2,863 ft.

N. CENTRAL TEXAS

Sivells Bend Pool Extended 1½ Miles South

WICHITA FALLS.—Sun Oil Co. 1 Mabel Field has extended the Sivells Bend pool in north central Cooke County 1½ miles south. It was completed for 244 bbl. of 41-gravity oil in 24 hours through ⅜-in. tubing choke from perforations in the Strawn from 6,670-82 ft. Casing pressure was 150 lb. and tubing pressure was 125 lb. Total depth is 7,024 ft.

Ohio Oil Co. 3 Ross, ½-mile extension to the Ross Strawn pool of eastern King County, logged soft lime showing oil from 5,345-52 ft., total depth. Operator was preparing to take drill-stem test.

Humble Oil & Refining Co. 1 Williams, wildcat 7 miles northeast of Sunset in southern Montague County, is dry at 6,221 ft. after electrical survey was run. Caddo was topped at 6,098 ft. Continental Oil Co. 1 Borden, wildcat 5 miles southeast of Newport in northeastern Jack County, ran tubing and was preparing to test the Ellenburger after plugging back to 6,906 ft.

The Gatewood pool in Cooke County had five completions this week, while the Henderson field in Clay County had two. Wichita County led in field locations with 12. Archer County had 11 and Cooke County had 5.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCATS

Montague County: New oil pool: W. B. Omohundro and Continental 1 Johnson, Blk. 6, Limestone CSL, 3½ mi. NE Stoneburg, elev. 917 ft., flowed 1,036 bbl. day through 30/64-in. choke, perf. 5,996-6,018 ft. Bend, gravity 42°, gas-oil ratio 722 to 1, TD 6,145 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: E. P. Bowen 1 C. Abercrombie, Blk. 70, J. W. Harris subd. of Club Ranch, dry, TD 1,515 ft.

Clay County: Kadane-Griffith Oil 1 G. D. and E. F. Rigsby, Sec. 18, Specht & McCutchen Sur. A-279, 2 mi. N and 1 mi. E Thornberry, dry, TD 3,560 ft.

Wichita County: W. H. Spradling 2 J. B. Spradling, Blk. 306, Waggoner Colony Land, 4 mi. E and 3 mi. N Electra, dry, TD 1,950 ft.

Wood & Closuit 1 Wm. Lalk, Blk. 272, Waggoner Lands, 4 mi. N and 2 mi. E Electra, dry, TD 2,103 ft.

WEST CENTRAL TEXAS

ABILENE.—S. B. Roberts 1 O. J. Cooper has given Jones County a new pool 7 miles northeast of Hawley. The well flowed oil at the rate of 15 bbl. in 1 hour after acidizing the Swastika lime between 2,312-32 ft.

The Texas Co. made location for a proposed 6,700-ft. test in the Royston field in Fisher County. It is 1-C D. W. Stephens in Section 82, Block 1, H&TC Survey, 8 miles east of Rotan.

Continental Oil Co. 1 Dobb, wildcat in Parker County, topped the Ellenburger at 6,090 ft. It was drilling to 6,413 ft. in dolomite. A 1-hour drill-stem test was run from 6,336-6,413 ft. and recovered 3,471 ft. of salt water. It is now plugging back to 6,226 ft.

Eastland County reported two field completions, one in the Sibley pool and one in the Hilburn pool. Coleman County had two new field locations, one in the Santa Anna field and one in the Coker field.

WEST CENTRAL TEXAS SUCCESSFUL WILDCATS

Coleman County: New oil pool: Hunter & Hunter 1 T. J. Hudson, D. F. Roddan Sur. No. 42, 2 mi. NW Coker field, pumped 65 bbl. day, perf. 3,609-29 ft. Gray, TD 3,712 ft.

Jones County: New oil pool: M. M. Travis et al 2 Nobles, B. Travine Sur. No. 190, elev. 1,666 ft., pumped 4 bbl. day, perf. 1,937-48 ft., Flippen, TD 2,188 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Coleman County: Ledge Petroleum 1 J. P.

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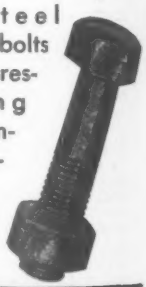

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Morris, R. Cochran Sur. No. 269, 1 mi. S Echo, elev. 1,560 ft., dry, TD 2,102 ft.

Jones County: Joe Josephson 1 J. S. Aston, Sec. 19, Orphan Asylum Land, 5 mi. E Anson, elev. 1,681 ft., King 2,430 ft., dry, TD 2,550 ft.

Harry Hines and B. H. Hilburn 1 John Sayles, R. Smith Sur. No. 192, 3 mi. NE Hawley, elev. 1,697 ft., dry, TD 2,440 ft.

PERMIAN BASIN

Devonian Oil Stained in Andrews Wildcat Test

MIDLAND.—Magnolia Petroleum Co. and Humble Oil & Refining Co. 1 E. P. Cowden, wildcat in the southwest corner of Andrews County, cored in the Devonian from 7,820-35 ft. Recovery was 15 ft. of white, finely crystalline dolomite with oil stains and odor and poor porosity. The Devonian was topped at 7,778 ft., 4,643 ft. below sea level. A 1-hour drill-stem test was then run from 7,801-35 ft. and 630 ft. of gas-cut drilling mud with no oil was recovered. Operator was preparing to deepen. Shell Oil Co., Inc. and The Texas Co. 1 Ratliff & Bedford, four-pay prospect in southwestern Andrews, ran another drill-stem test in the Ellenburger from 11,226-69 ft. Recovery was 500 ft. of clean oil and 650 ft. of heavily oil and gas-cut drilling mud. The packer failed after 28 minutes. There was a good steady flow of air and gas showed at the surface in 11½ minutes. The Ellenburger was entered at 11,018 ft., 7,814 ft. below sea level. It was fishing for bit cones at 11,304 ft. in dolomite.

Crane County.—Applications for permits to drill six outposts to its 1-A University in east central Crane have been filed by the Atlantic Refining Co. The tests are to be carried to 10,000 ft., but the primary purpose will be to explore the Devonian above 9,000 ft. The prospective discovery made a drill-stem test from 9,020-15 ft. The packer failed after 30 minutes and 90 ft. of drilling mud with no shows was recovered. It was drilling below 9,138 ft. in brown lime and chert. Humble 1 G. H. Cowden, wildcat 2 miles west of the shallow Crane-Cowden field, recovered 35 ft. of drilling mud with no shows on a 1-hour drill-stem test from 6,403-43 ft. There was a slight blow of air at the beginning of the test but none at the end.

Crockett County.—Amerada Petroleum Corp. 2-B J. S. Todd, ninth producer from the Ellenburger in the Todd Deep field, has been completed as the biggest producer. It flowed 2,947.68 bbl. of 40-gravity oil in 24 hours.

Gaines County.—Shell will drill 2 G. M. Cox, 1,900 ft. northeast of 1 Cox, a northeast extension to 1 Pierson, and a 1¼-mile extension to the Russell field. 2 Cox will be a 7,800-ft. test for Clear Fork pay and is in Section 452, Block G, GCS&-RGNG Survey. 1 Cox, with total depth of 7,714 ft., flowed 735 bbl. of oil in the first 24 hours on official test.

The Fullerton pool, Andrews County, reported 11 development completions. The Keystone area, Winkler County, reported three wells, the TXL pool, Ector County, two, and the Slaughter pool, Hockley and Cochran counties, two. The Sand Hills-Tubb pool, Crane County, led in field locations with six. The Fullerton pool had four and the Taylor-Link pool, Pecos County, had three.

WEST TEXAS SUCCESSFUL WILDCAT

Ector County: Extension to TXL pool—Phillips 1-A TXL, Sec. 21, Blk. 45, T-1-S, T&P Sur., SE outpost TXL field, elev. 3,292 ft., TD 9,853 ft., flowed 1,650 bbl. day from Ellenburger through ½-in. choke on 2-in. tubing, perf. 9,680-90 and 9,775-93 ft., Ellenburger 9,600 ft., Silurian 8,420 ft. (first well in TXL field to find oil in the Silurian; on drill-stem test flowed 60 bbl. 34° gravity oil in 1 hour from Silurian at 8,421-71 ft.)

WEST TEXAS WILDCAT FAILURES

Pecos County: Oscar Donley 1 D. C. O. Wilson, Sec. 5, Blk. 145, T&St.L. Sur., 3 mi. W McDer pool, dry, TD 1,812 ft.

Dave Elder 1 J. H. Tippett, Sec. 64, Blk. 194, GC&SF Sur., 5 mi. NW Yates field, San Andres 1,420 ft., dry, TD 1,515 ft.

Val Verde County: B. F. Wilson 1 fee, Sec. 57, Blk. E, GC&SF Sur., dry, TD 430 ft.

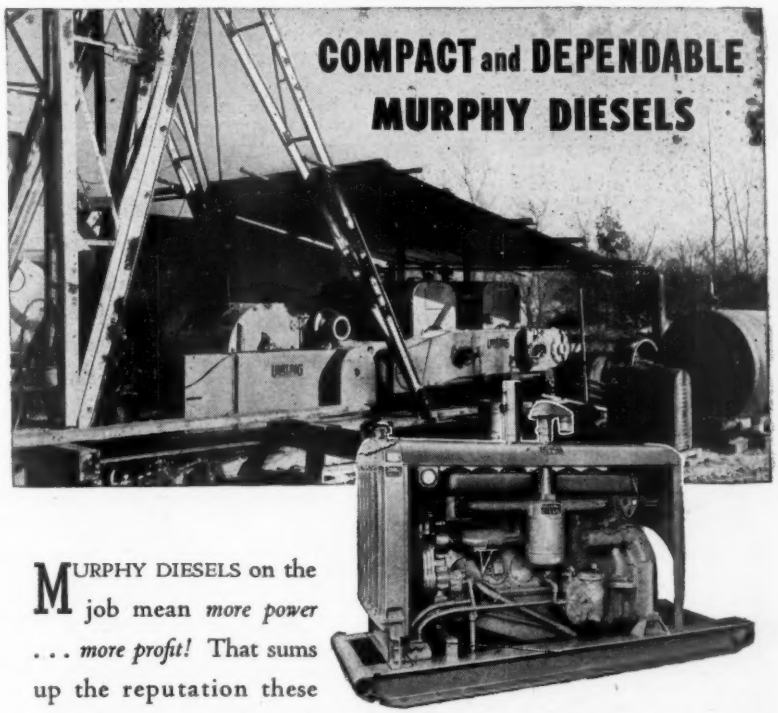
SOUTHEASTERN NEW MEXICO

HOBBS.—A 5,500-ft. wildcat test will be drilled by Taylor, Powell & Wallrich in south central Lea County. It is 1 E. Page, 660 ft. out of the northwest corner of the southeast quarter of 26-24s-34e, near Ochoa.

Neville G. Penrose, Inc. 1 Federal-Penrose, wildcat 5 miles northwest of the Drinkard-Yeso well and about 3 miles west of Gulf Oil Corp. 1 Paddock, recent Holt zone discovery, unloaded after recovering 12 stands of heavily oil and gas-cut mud on an 80-minute drill-stem test from 8,070-8,118 ft.

Humble Oil & Refining Co. 1 Penrose, lower Permian producer in the Skelly-Penrose shallow field, was swabbing about ¾ bbl. of pipe-line oil hourly after being treated with 2,000 gal. of acid through perforations from 6,330-6,470 ft.

Stanolind Oil & Gas Co. 1 W. H. Jones, wildcat 7 miles southeast of Hobbs, drilled to 10,580.5 ft. A drill-stem test was run from 10,538-80 ft. and recovered 30 ft. of drilling mud with no shows. It will be



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plugged back to 7,700 ft. to test the Clear Fork where it had some shows.

Artesia field, Eddy County, and the Paddock field, Lea County, each had two field completions. The Paddock field had two new locations, as did the Drinkard-Yeso field, Lea County.

SOUTHEASTERN NEW MEXICO SUCCESSFUL WILDCAT

Lea County: New gas pay: Texas 1 Blinebry, 19-22s-38e, Drinkard-Yeso field, flowed 11,700,000 cu. ft. gas, perf. 5,580-5,625 ft. Upper Clear Fork, gas-oil ratio 117,000 to 1, plugged back to 5,630 ft., TD 7,317 ft.

OHIO, KENTUCKY

Columbiana Gas Pool Gains Fifth Producer

COLUMBUS.—The Ohio Oil Co. 1 Carter Oil Co. 1 Carter-Kurtz, Section 14, Knox Township, the fifth gas completion in the new Columbiana pool, came in at 1,470,000 cu. ft. and was shut in after shot increased gage to 3,186,000 cu. ft. Oriskany sand was found at 3,501-27 ft.

Ohio Fuel Gas Co. 1 Mary Kowalski, Lot 2, Penfield Township, Lorain County, is an additional large open flow well in the Middle Wellington pool. Upper Clinton sand at 2,400-15 ft. gaged 6,580,-000 cu. ft. natural.

The Berea sand oil pool in Meigs County was extended ½ mile east by Proffitt 1 Pomeroy National Bank, Section 32, Chester Township. Berea sand at 1,610-23 ft. made 22 bbl. of oil and 240,000 cu. ft. gas after shot.

Of the 21 new locations this week, the Stewart field led with 6. Ashland-Lorain topped the completion list with seven wells.

OHIO SUCCESSFUL WILDCAT

Muskingum County, Adams Township: South Penn Oil 1 H. M. Vernon, Sec. 19, Clinton 4,180-4,226 ft., 283,000 cu. ft., Medina 4,272-4,275 ft., dry, TD 4,344 ft.

WESTERN KENTUCKY

OWENSBORO.—Four oil wells and four dry holes were reported completed in western Kentucky in the past week. A Todd County wildcat, which occasioned some interest for a while, turned out to be a 10-bbl well in Devonian lime. Two oil wells in Union County, good for 124 bbl. and 232 bbl. per day, respectively, were the feature completions.

WESTERN KENTUCKY SUCCESSFUL WILDCAT

Todd County: Ekirk Associates 1 M. Stinson, 8-D-29, near Elkton, Devonian lime 1,389-92 ft., TD 1,406 ft., acidized, pumped 10 bbl. in 24 hours.

WESTERN KENTUCKY WILDCAT FAILURES

Union County: Gulf Refining 1 J. L. Kennard, 15-Q-20, dry at 2,744 ft. Penn sand at 1,126-40 ft. had salt water and a showing of oil.

Webster County: Cherry & Kidd et al 1 G. A. Tapp, 17-N-23, dry at 2,789 ft. Glen Dean 2,017 ft., Barlow 2,254 ft., McClosky 2,650 ft.

INDIANA

EVANSVILLE.—One oil well, good for 117 bbl. initially and five dry holes comprised Indiana's completion record for the week.

INDIANA WILDCAT FAILURE

Gibson County: Kingwood 1 A. L. John-

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son, SE SE SE 9-3s-12w, dry at 2,800 ft. Lower Menard 1,902 ft., Barlow 2,324 ft., Ste. Genevieve 2,642 ft., McClosky 2,719 ft.

ROCKY MOUNTAIN

Big Play In SE Colorado Gets Under Way

DENVER.—The southeastern corner of Colorado, embracing an area of more than 100 miles square, which quietly has been receiving attention from a number of large operators during the past year, is developing into a major wildcat play comparable with any in the Rocky Mountain area. The renewal of interest in the region became apparent last March when Union Oil Co. of California and Richfield Oil Co. released a location for 1 Kroell, SE NW NW 27-21s-46w, on the East May Valley structure in Prowers County. This was followed last week by Skelly Oil Co. building a rig for a test 9 miles north of the Oklahoma and 16 miles west of the Kansas boundaries in SE SW 34-33n-44w, in Baca County. These developments brought to light the extent of recent activity in that area, which lies principally in Baca, Bent, Las Animas and Prowers counties.

The largest block under lease is held jointly by Frontier Refining Co. and J. M. Huber Corp. in Bent, Las Animas and Baca counties, and comprises in excess of 115,000 acres. It is named from Freezeout Creek, which runs through the block. It lies between two tests drilled by the old Marland Oil Co. several years ago; 1 Pipe Springs in 27-27s-49w, and 1 Table Mesa in 8-30-50. The first of these found all formations in place down to the Ordovician at 6,084 ft., total depth, but the Table Mesa well encountered granite at 2,089 ft. The Frontier-Huber play is based on the results in these wells indicating existence of a stratigraphic trap, further confirmed by subsequent geology.

Skelly Oil Co. had three blocks in central Baca County and within the past few weeks has taken a fourth, of about 30,000 acres, in Townships 28s and 29s, Ranges 48w and 49w.

Frontier Refining Co. and Pacific Western Oil Corp. jointly have a large block, known as the Caddo, in Townships 25s and 26s, Ranges 49w and 50w. This block will be drilled this year.

Pure Oil Co. has a block in Baca County south of the Frontier-Huber Freezeout Creek block, which is considered a part of the same play. The company has done considerable coredrilling.

Frontier, joint with Pacific Western, has the South Caddoa block in Townships 26s and 27s, Ranges 49w and 50w. J. M. Huber Corp. has a block in Townships 24s and 25s, Ranges 48w and 49w. Huber and Frontier also have joint holdings in Township 26s, Ranges 50w and 51w.

East May Valley.—Union Oil Co.-Richfield Oil Co. 1 Kroell, SE NW NW 27-21s-46w, East May Valley structure, Prowers County, which had sufficient shows down to 3,960 ft. to justify running pipe and testing, set whipstock at around 1,000 ft. following failure to clear hole of the 5½-in. and is redrilling near old total depth.

Show in Tensleep in Lamb test.—Hageman, Pond & Hanlon 1 Government, SW SE 12-51n-93w, Lamb structure, Big Horn County, Wyoming, recovered 6 ft. of saturated core from the Tensleep at 3,449 ft., total depth, but drill-stem test was negative. Casing is being set on top of the sand and it will be drilled in with cable tools. The structure is on the east side of the Big Horn basin. For a number of years it produced gas from the lower Frontier and Muddy sands, but this is the first test to the Tensleep.

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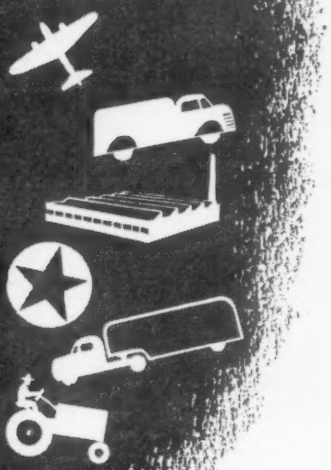

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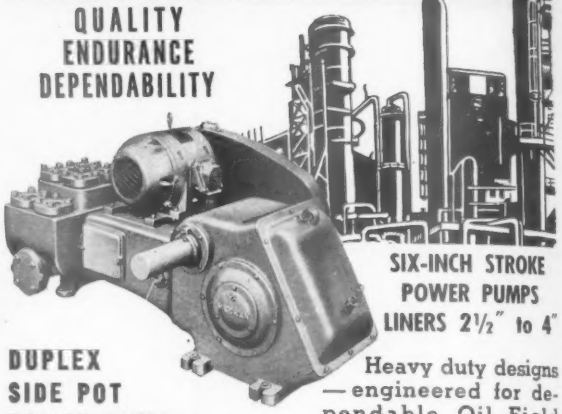

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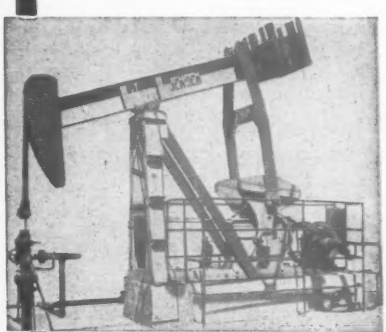

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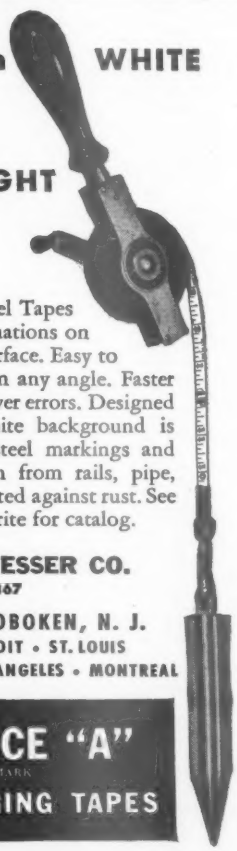

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tions were reported in the Rocky Mountain area, of which one was a wildcat. These were distributed: Wyoming, 5; Montana, 10. Six of the Montana operations were in Kevin-Sunburst and two in Cut Bank. In Wyoming, Garland, North Spring Creek and Black Mountain had one each and Half Moon two.

Completions. — Twenty-two completions were reported, of which 16 were oil wells, with an initial production of 3,066 bbls., 5 were dry and 1 was a gas well. Three of the dry holes were wildcats. Completions were distributed as follows: Colorado, 2; Wyoming, 10, and Montana, 10.

WILDCAT FAILURES COMPLETED IN WYOMING

Crook County, Kara Terrace: M. D. Miller 1 Bullsnake, SE SE SE 19-49n-66w, TD 2,365 ft., dry, no Muddy sand, small show in Wall Creek.

M. D. Miller 2 Kara Terrace, SE NE SE 25-49n-67w, TD 1,630 ft., dry, no Muddy sand.

Fremont County, Spring Creek: Phillips Petroleum 2 Hintze Unit, CNL NE NW 7-28n-92w, TD 4,774 ft., dry in Sundance, top Sundance 4,075 ft., top Dakota 3,085 ft., steep dip of formations.

LA.-ARK.

Stephens Pool Adds Four New Producers

MAGNOLIA.—The Stephens pool of Columbia, Nevada, and Ouachita counties, added four new oilers this week, with a combined initial production of 222 bbl. R. H. Crow, trustee, completed two wells, E-3 and E-4 J. W. Smart, for 120 bbl. and 60 bbl. respectively. Durbin Bond completed the A-3 J. B. Morgan for 27 bbl. from the Blossom sand, and Claud Lee completed 1 Lewis Smart for 15 bbl. from the Blossom sand.

In the North Louisiana fields, Delhi added another good producer in the C. H. Murphy, Jr., and Sun Oil Co. 9 Holt, NW SW 21-17n-9e. The well produced 288 bbl. per day from the Paluxy and Holt sands at 3,340-50 ft.

North Louisiana fields have seven new locations announced, including two wildcats. The wildcat tests will be drilled in Madison and Richland counties.

ARKANSAS WILDCAT FAILURES

Desha County: W. S. Goodwin 1 Banks, NW SE 32-9s-4w, dry, TD 4,850 ft.

MISSISSIPPI

Eight Completions Include Five New Oilers

JACKSON.—Eight wells were completed in Mississippi this week, including five oil wells, two in Cranfield, and one each in Eucutta, East Heidelberg, and West Heidelberg. No wildcats were completed. Largest well of the week was in Cranfield pool, California Co. 6 Lees, in 29-7n-1w. Initial production was a flow of 285 bbl. of 39-gravity oil in 24 hours from the Massive sand at 10,276-10,308 ft.

In the new Hub field, Humble Oil & Refining Co. 1 Ball, 20-2n-14e, cored sand with a show of gas at 8,050-61 ft. in the upper Tuscaloosa. On a drill-stem test at 8,052-62 ft., the well flowed gas and condensate for 20 minutes with a top pressure of 1,400 lb. No shows were reported in this zone in the discovery well of the Hub field.

Mississippi reports eight new locations, including four wildcat locations. Eucutta field leads with two locations, and the other two field tries will be in Cranfield and Gwinville pools. The wildcats will be drilled in Hinds, Jefferson, and Wayne counties, with Wayne County having two locations.

ALABAMA WILDCAT FAILURE

Washington County: Wayne Refining 1 Mitchell, approx. SE NW NE 12-8n-3w, dry, TD 4,432 ft., Tuscaloosa (?) 3,860 ft.

GEORGIA WILDCAT FAILURE

Laurens County: Calaphor Manufacturing 1 McClain, 10 mi. E. Dublin, in military district, no surveys, dry, in granite, at TD 2,548 ft.

KANSAS

Kraft-Prusa Pool Extended to North

ARBUCKLE lime production in the Kraft-Prusa pool appears to have been extended about ½ mile to the north by Black-Marshall 1 Ney, NE NE SE 8-16-11w. Kansas City was cut at 2,980 ft., conglomerate at 3,266 ft., and Arbuckle at 3,295 ft. Pipe was set at 3,266 ft., and 1,700 ft. of oil rose in the hole in 8 hours. A potential of 253 bbl. has been given the well.

Stanolind Oil & Gas Co. and Skelly Oil Co. 1 Benson, interesting wildcat in NW NW NW 30-23-15w, in Pawnee County, is running electrical survey. Pipe will be set on bottom after the survey. The last drill-stem test, taken in the Arbuckle at 4,139-65 ft., recovered 2,500,000 cu. ft. of gas and 240 ft. of sulfur water in 30 minutes. Previous drill-stem test in the Lansing recovered gas-cut oil. This test is 3 miles southeast of the Zook pool.

Ellis County has a possibility of a new pool in Darby & Bothwell, Inc., 1 Cromb, NE NW NW 22-11-20w, about 4 miles west of Solomon pool and northeast of Ellis pool. Lansing lime was cut at 3,374 ft., Kansas City at 3,590 ft., Simpson at 3,669 ft., and Arbuckle at 3,680 ft. The log shows saturation and porosity from 3,682 ft. to 3,685 ft. Some free oil appeared in the samples and 5-in. pipe was set at 3,682 ft. Plug will be drilled this coming week.

Kansas completions totaled 28, including 15 oil wells and 1 gas well. Trapp and Lost Springs pools vied for first place, with three completions each. The four dry wildcats were completed in Ellis and Butler counties. New locations for the week number 37, including 12 wildcat tries. Barton County leads with two new wildcat locations, and other wildcats are spotted one each in Butler, Greenwood, McPherson, Marion, Reno, Rice, Rush, Russell, Stafford and Woodson counties.

KANSAS WILDCAT FAILURES

Butler County: O. J. Connell et al 1 Butler County Farm, SW SW NE 6-26-6e, dry, TD 2,806 ft., elev. 1,335 ft., Mississippi lime 2,754 ft.

Ward McGinnis 1 Leet, NW NW NE 27-25-6e, dry, TD 2,818 ft., elev. 1,348 ft., Mississippi lime 2,757 ft.

Ellis County: Bridgeport Drilling and Yellow Cab 1 Snapp "A", NW NW NW 27-11-16w, dry, TD 3,410 ft., elev. 1,792 ft., Arbuckle 3,360 ft.

Virginia Drilling 1 Zimmerman, SE SE NW 26-15-19w, dry, TD 3,597 ft., elev. 1,992 ft., Arbuckle 3,568 ft., Cambrian 3,592 ft.

FOREST CITY BASIN

ST. JOSEPH, Mo.—R. S. Tomer Production Co. has set pipe in the Hunton lime for a test of its fifth operation in the Morrill pool of Brown County, Kansas, the 1 Warner in NE SE NE 4-1s-15e. The well is 1,320 ft. north and the same distance west of the discovery well and is 14 ft. lower on structure. Hunton lime in 1 Warner was reached at 2,650 ft.

The company had a dry hole at its fourth operation, 1 A. E. Knisely in NE NW NW 10-1s-15e. This was the southernmost operation and it ran 24 ft. lower than the discovery well. Hunton was topped at 2,656 ft., elevation was 1,139 ft.

OKLAHOMA

Important Deep Wildcats Make Slow Progress

WIDELY scattered Oklahoma wildcats, mostly lying west of the Indian meridian in Garfield, Kingfisher, Logan, Oklahoma, Garvin, Stephens, McClain and Beckham counties are keeping up a keen general interest while slowly approaching the completion stage.

Phillips Petroleum Co. 1 Airport, C NE NE 8-12n-4w, Oklahoma County, was drilling below 7,130 ft. The location is such that the well, if successful, might extend the West Edmond field southerly, or the Bethany field northerly, or open a new pool.

A. R. Jordan et al 1 Caudill, SE NW NW 35-9n-25w, Beckham County wildcat, east of Erick, was scheduled for a production test some time this week. The well found Granite Wash at 3,040 ft. and was drilled to 3,104 ft. A drill-stem test showed big gas in 2 minutes and recovered 1,000 ft. of oil-cut mud. Casing was set on top of Granite Wash. The Jordan interests have about 9,000 acres around the well and a general rush for acreage followed the news of the Granite Wash showing. The Jordan test is about 4 miles south of the Erick gas field in which a deep-seated gas zone was recently found by the Tide Water and Skelly companies.

Cities Service Co. 1 Abernathy, SE SW SE 13-3n-2w, Garvin County, Antroch pool discovery well, which has been pumping from 200 to 300 bbl. a day from Bromide sand at 5,494-5,502 ft. was scheduled for deepening this week.

The West Edmond field was extended a quarter mile northerly by Phillips Petroleum Co. 1 Bierman, C SW SW 19-15n-4w, Logan County. The well produced 935 bbl. in 24 hours through a quarter-inch choke, from Hunton lime bottomed at 6,966 ft.

Two prospective pool openers of Gulf Oil Corp., one in Stephens County, the other in Garfield County, were being watched. In Garfield County Gulf 1 Decker, SE SW NW 12-20n-4w, was cleaning out at 6,111 ft., total depth 6,119 ft. Cleaning out was interrupted long enough to run the swab, recovering 55 bbl. of oil in 4 hours and on the following day 25 bbl. in 2½ hours. Second Wilcox sand was topped at 6,078 ft. In Stephens County, Gulf 1 Briscoe estate, C SE NW 36-2n-8w, south of Marlow, was drilling at 7,867 ft. With packer set at 7,738 ft. a drill-stem test was made and gas at the rate of 10,000,000 cu. ft per day, 15 ft. of gas-cut mud and 15 ft. of distillate recovered.

Phillips Petroleum and Carter Oil companies 1 Jirick, C SW NW NW 26-16n-5w, had Oswego lime at 6,290 ft. A drill-stem test at 6,320-6,410 ft. recovered 135 ft. of oil and gas-cut mud and some free oil in 40 minutes. It was drilling at 6,411 ft.

The Texas Co. 1 Arundel, C SE NE SW 2-15n-1w, Logan County, 7 miles north of the Arcadia pool in Oklahoma County, topped Bartlesville sand at 5,238 ft., Viola lime at 5,633 ft., Wilcox sand at 5,805 ft., total depth 5,923 ft. Bartlesville sand

(Continued on page 189)

PENBERTHY
"REFLEX"
WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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EIGHT interchangeable cutters. Fast cutting action, directed at 30 degree angle, cutters are hard surfaced steel. See Composite Catalog or write for Bulletin and additional information.

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BAKERSFIELD, VENTURA AND AVENAL, CALIFORNIA

Among the

Drilling Contractors

Joe Long Drilling Co., Longview, Tex., has sold 52 wells to P. G. Lake, Inc., Tyler, Tex., in a deal said to involve $2,000,000. The wells are situated in the Meredith Survey of Gregg County, in the eastern part of the field. The purchase gives the Lake firm 112 producing wells.

Parker Drilling Co., Tulsa, has the contract for a 15,000-ft. test to be drilled in Grady County, Oklahoma. The well is Ohio Oil Co. 1 Harrison, NW SE 29-3n-5w, and is planned to be the deepest well drilled so far in Oklahoma. Parker Drilling Co. plans to use a diesel electric outfit powered by two 350-hp. engines, built for the heaviest work.

O. J. Connell is drilling contractor on the John Zeigler 1 John Teter, in NE NE SE 36-25-5e, Butler County, Kansas. The test is 1 mile east of Eldorado, and will be drilled to the Mississippi lime formation, although oil is expected in the Bartlesville.

K. de K. Drilling Corp., of Edmonton, is starting work on Edgerton Oils 3, LSD 9, 18-43-4w4, in the Edgerton area of eastern Alberta. The new location is about a mile southwest of Edgerton 2, drilled by the same contractors, which had oil shows in the Devonian limestone at 2,689 ft.

Ajax Drilling Co. and C. L. Maguire, Inc., have consolidated to form a new firm to engage in contract drilling. The consolidation includes only the Maguire drilling interests. It is expected that the new firm will operate under the Ajax name.

E. K. Carey, McPherson, Kans., has been awarded drilling contract on the Derby Oil Co. 1 Robertson, in SE SE SE 35-20-3e, Marion County, Kansas. Contractor has a half interest in the test.

Harry B. Stroud has been awarded drilling contract on the Del Fortney 1 John F. and Margaret L. Eddy, in SW NW NW 10-1s-15w, Van Buren County, Michigan.

Falcon-Seaboard Drilling Co. and Mid-Co Oil Corp. were to move in for a Wilcox sand test 5 miles north of the Otoe City pool in Noble County, Oklahoma. The wildcat will be the 1 Bar-Lo Ranch, in SW SE NW 27-23n-1e. The Layton sand is expected near 3,300 ft. and the Wilcox around 4,800 ft.

American Drilling Co. is the contractor on the Michigan Oil Co. 1 John Dewald, in SE SE NW 25-20n-6e, Arenac County, Michigan.

Cook Drilling Co. has been awarded contract on the Skelly Oil Co. 1 A. Bridgeforth, in C NE NE SE 20-12n-2e, scheduled deep test in Yazoo County, Mississippi.

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"MITT-GRIP"
COLLAR
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ELECTRODE HOLDER

- Makes rod-changing *easier* and *quicker*, because it provides a positive, convenient grip on the insulator.
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See your local distributor.

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MODEL 3H
300 Amp.

Unibolt
"FLEXI-BALL JOINT"
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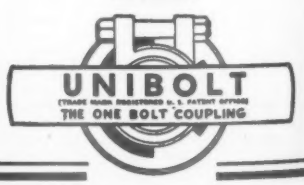

The Multi-range lightweight BJ Type "T" Tong for Drilling or Production Rigs

Designed to lighten and speed up the job of running tubing, BJ type "T" tongs are equally valuable in "nippling up" or as lay tongs. Made in five series: A, B, C, D, and E, with available jaws in each series to handle API tubing and coupling sizes from 1" to 4", plain or upset.

Change in size of tong jaws can be made quickly and easily. The dies are self sharpening and provide a quick, positive, non-crushing grip. The handle is made of reinforced seamless tubing, and is designed to provide sturdy, balanced construction. Stabbed on, these tongs cannot come open even if hinge pin fails, yet jaws easily release by pulling back on the sleeve. Call your BJ supplier and let him equip your rigs with "T" tongs.

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Baroid products in stock at Riverton and Rawlins, Wyoming, and Craig, Colorado.

DAWSON & CORBETT
RAWLINS • Box 288 • WYOMING

Oklahoma Fields

(Continued from page 187)

showed oil but there were no showings below that. The hole filled 3,200 ft. with oil and then flowed 5 bbl. per hour, but salt water broke in presumably coming from the Wilcox interval. Plug was recemented and the well swabbed 115 bbl. of clean oil in 15 hours.

Continental Oil Co. 1 Butterly, NW SW SE 14-1n-1e, a deep test in a shallow gas area in Garvin County, close to the Murray County line, swabbed 52 bbl. of oil in 10 hours from Arbuckle lime, total depth 4,423 ft., but the hole had been loaded with 100 bbl. of oil. When the load was exhausted the well swabbed 11 bbl. of new oil and then testing was interrupted by mechanical troubles. Later 1,920 ft. of fluid, mostly oil, rose in the hole. Sinclair Prairie Oil Co. will offset with 1 Tom Youngblood, SW SW SW 13-1n-1e, Murray County.

OKLAHOMA WILDCAT FAILURES

Garvin County: Texas Co. 1 Dean, NW NW NE 21-5n-2e, dry, TD 5,212 ft., elev. 1, 084 ft., Viola 4,720 ft., Bromide Dense 5,036 ft., Second Wilcox 5,121 ft.

Kingfisher County: Gulf Oil 1 Triplett, NE SW 8-15n-5w, dry, TD 7,692 ft., elev. 1,096 ft., Woodford 7,316 ft., Hunton 7,362 ft.

Lincoln County: Mid-States Oil 1 Kalka, SW SW SW 20-13n-5e, dry, TD 5,185 ft., elev. 930 ft., Wilcox 5,120 ft., Second Wilcox 5,154 ft.

Murray County: Ashland Oil & Refining 1 James, NE NE SE 29-2s-3e, dry, TD 634 ft., Viola 294 ft., still in Viola at 634 ft., total depth.

Noble County: Barney Feagin 1 Will, NW NE NE 15-21n-2e, dry, TD 4,516 ft., elev. 934 ft., Wilcox 4,472 ft., Second Wilcox 4,510 ft.

Oklahoma County: Vickers Petroleum 1 Varnum, SE SW SW 25-14n-1w, dry, TD 5,875 ft., elev. 979 ft., Wilcox 5,750 ft., Second Wilcox 5,855 ft.

Pottawatomie County: Ashland Oil & Refining 1 Clemmence, SE NW SW 21-11n-5e, dry, TD 4,825 ft., elev. 921 ft., Wilcox 4,820 ft.

CALENDAR

October

American Association of Oil Well Drilling Contractors, Oklahoma City, October 1-2.

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 4-6

I.P.A.A., annual membership meeting Tulsa, October 15, 16 and 17.

LEGAL

Farm Security Administration, Little Rock, Arkansas, June 30, 1945. Sealed bids in triplicate will be received until 2 o'clock P.M., CWT, August 6, 1945, and then publicly opened, offering bonus for operating rights in connection with gas and oil leases on 1562.95 acres of land in Madison Parish, Louisiana, known as the Bruce Plantation. Land composed of Lots Four (4) and Five (5) and ten acres off the East side of Lot Three (3) of Section Thirty-two (32); also the South half of Section Thirty-two (32); and also all of the South half of Section Thirty-three (33) which lies South of the Tensas River; all in Township Seventeen (17) North, Range Eleven (11) East; also North half of Section Four (4); the North half of Section Five (5); and the North half of Section Six (6) in Township Sixteen (16) North, Range Eleven (11) East. Containing in all 1562.95 acres, more or less. Award of lease will be made only to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms and operating regulations from F. E Bates, Regional Business Manager, Farm Security Administration, Little Rock, Arkansas.

WORTH WAITING FOR BUT NO WAITING IS NECESSARY

'BESTOLIFE—the Lead Seal Joint Compound used successfully in the Drilling and Refining Industries for years—is immediately available through more than 100 distributors in the U.S.A. Any priority rating will do.

Your nearest supply house field store probably has 'BESTOLIFE in stock for immediate delivery. Use 'BESTOLIFE—it's BETTER!

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LOS ANGELES 1, CALIFORNIA

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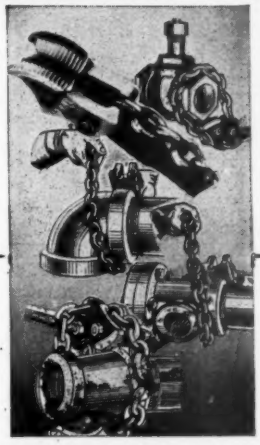
ARMSTRONG BROS.



IDEAL CHAIN TONGS

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The JAWS have straight teeth for pipe, and V shaped teeth for fittings. Drop-forged from special high carbon steel carefully milled, heat-treated and hardened for toughness and lasting qualities.

The HANDLES are forged from spring steel heat-treated to give the required stiffness.

The CHAINS are proof-tested.

Write for catalog for complete showing and description of "Armstrong Bros." Pipe Tools.

ARMSTRONG BROS. TOOL CO.
CHICAGO U.S.A.

PERSONALS

Named Manager of Foreign Affairs For Texas

W F. MOORE, who has been named general manager of foreign operations for The Texas Co., is a native of Georgia and rounds out his twenty-fifth anniversary with the company this year.

After leaving the U. S. Navy in 1920 Moore went to work for Texas in the power department of its Port Arthur, Tex., refinery. He remained in the refining division in various engineering capacities until 1930, except for intervals of special assignment to other branches of the company's activities.

From 1930 to 1938 Moore represented the company in both domestic and foreign fields in connection with patent and research interests. He served as chief purchasing officer for the next 5 years. From 1943 until his recent promotion he was assigned to foreign operations as assistant to the vice president, acting in an administrative capacity.

Lewis A. Ellis is in charge of a new office which Ashland Oil & Refining Co. has opened in Shreveport. **Rex Ryan** is geologist. This follows by a few weeks the establishment of an office in Fort Worth, with **V. Fern Fuson** in charge. Both new offices report to Tulsa, Mid-Continent headquarters.

Waldo Sheldon, formerly general manager of Venezuelan operations for Socony-Vacuum Oil Co., Inc., with headquarters in Caracas, has been assigned to the New York staff of the foreign producing department. **H. I. Fry** succeeds him in Caracas.

David Scott, Jr. was elected president of Bradford District Oil Producers Association at the annual meeting in Bradford, Pa. **Carl Oliver** was chosen first vice president, **A. L. Yerdon** second vice president, and **George H. Daggett** secretary-treasurer.

John Stewart Harrison, formerly superintendent of the Standard Oil Co. (New Jersey) refinery at Aruba, Netherlands West Indies, has been made a member of the United States Group Control Council for Germany as consultant to the economics division on fuels and oils. Harrison is a veteran of World War 1, and his home was in Albuquerque, N. M.

John W. Crutchfield, formerly senior petroleum engineer for Humble Oil & Refining Co. in its Southwest Texas division, has resigned to enter consulting petroleum engineering work, with offices in Corpus Christi.

J. W. Bradbury, of Mene Grande Oil Co., has been transferred to Caracas from Maracaibo in the position of assistant to the president. Formerly Bradbury was acting division manager at Maracaibo. **L. T. Jordan,** previously assistant to Bradbury, has become the acting division manager at Maracaibo.

J. B. Hines, Jr., who was head of the land department of Superior Oil Co. of California in Houston, has been transferred to Oklahoma City.

O. B. Rylander has been appointed manager of the western division in Venezuela of Socony-Vacuum Oil Co., Inc., with headquarters in Barinas.

Maj. Paul E. Taliaferro, in civilian life vice president and general attorney for Sunray Oil Co., Tulsa, has been assigned to duty in the judge advocate section at Lt. Gen. Barton K. Yount's AAF Training Command headquarters, Fort Worth.

Thomas Wishered, formerly assistant to **H. J. Robertson,** manager and chief chemist of the demulsifier department of Sinclair Refining Co.'s Sand Springs plant near Tulsa, has been promoted to manager and chief chemist. Robertson, chief chemist for Pierce Petroleum Corp. when it was acquired by Sinclair, has retired. **E. D. Cole** has been advanced to assistant manager.

Dr. H. D. Hedberg has been transferred from Santa Tome to the Caracas office of Mene Grande Oil Co. as assistant chief geologist.

Robert B. Parriott, who was a petroleum production engineer for Leader Oil Co. in Tulsa when he entered military service, has been promoted from major to lieutenant colonel in the Twenty-sixth infantry division in Europe. Colonel Parriott is a graduate of Staunton Military Academy and University of Texas.

Dr. W. E. Clark, of the Caribbean Petroleum Co., has been appointed assistant manager in western Venezuela and is also acting as general field superintendent there.

Carl A. Harris, formerly manager of the Burnham, Ill., refinery of Calumet Refining Co., has been made general manager of the company, with headquarters in Chicago. He succeeds **A. J. Smith,** who resigned. Harris, who has been with Calumet 22 years, was also elected a director.

W. G. Skelly, president of Skelly Oil Co., has been chosen president of the new home-ownership group which will operate the Tulsa Oilers baseball club when the Texas League resumes play. **John E. Mabee,** president of Mabee Oil & Gas Co., was elected vice president, and **W. K. Warren,** president Warren Petroleum Corp., secretary-treasurer.

H. R. McCombie, who was senior chemist of Shell Chemical Co.'s Torrance plant, has been advanced to chief chemist.

Joe Ward, who was district geologist for Mid-Continent Petroleum Corp. in San Antonio, has been transferred to Shreveport, to head a geological department being established there.

A. L. Owens, division manager of the Maracaibo district for Creole Petroleum Corp., has been transferred to Cairo to represent the Standard Oil Co. (New Jersey) interests there.

PUMPS for PETROLEUM PRODUCTS

Write for Bulletin 102— Pumps for the Petroleum Industry

It will tell you why

BLACKMER ROTARIES
are SELF-ADJUSTING FOR WEAR

GATHERING PUMPS
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Capacities to 750 GPM.
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Screw Type
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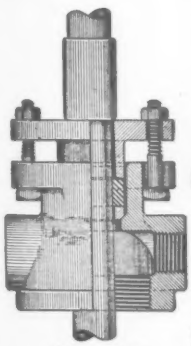

ONE OF OVER 300 ALTEN OIL FIELD PRODUCTS

Fig. A-106

See Composite Catalog for complete list or write us for catalog.

ALTEN'S
FOUNDRY and MACHINE WORKS
Established 1889 . . . . . Lancaster, Ohio
EXPORT OFFICE: 342 Madison Ave., New York 17, New York
TEXAS OFFICE: 46 San Jacinto St., Houston 1, Texas
Leading Supply Stores Carry All Alten Oil Field Equipment

MARKET QUOTATIONS

Prices as of July 24, 1945

(This service is abbreviated because most refinery products are selling at the Government's price ceilings. Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gallon.)

REFINERY GASOLINE

Octane (A.S.T.M.)	76†	70-74
Mid-Continent*	6.75	5.875
Gulf Coast	6.75	5.625
Northeast Coast	...	9.075
California	...	6.50-7.00

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	4.500	5.400
North Texas (f.o.b. plant)	4.125	4.950
North Louisiana (f.o.b. plant)	4.375	5.250
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.

East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana	1.18
Illinois Basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas	1.08

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$0.80	....	....	....
19-19.9	.84	....	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended July 14, 1945
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks Gasoline	Stocks Distillate	Stocks Residual
East Coast	785	13,192	7,919	6,363
Appalachian	146	3,540	1,023	416
Ill., Ind., Ky.	789	19,409	4,794	2,579
Okla., Kan., Mo.	392	9,023	1,914	1,355
Inland Texas	245	2,727	591	909
Tex. Gulf Coast	1,158	14,720	6,002	5,628
La. Gulf Coast	267	4,173	1,647	972
North La., Ark.	89	2,452	850	190
Rocky Mt.	142	2,370	354	659
California	932	13,795	9,710	22,418
Total 7-14-45	4,945	*85,401	34,804	41,489
Total 7- 7-45	5,006	†86,329	33,677	40,754
Total 7-15-44	4,588	80,854	36,907	54,804

*Military 39,322; civilian 46,079. †Revised.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
July 14, 1945	216,355,000
July 7, 1945	217,250,000
July 15, 1944	226,513,000

*Excludes unrefinable California stocks.

Doubles tool joint life

For fifteen years Tube Borium has been used on drilling bits to increase cutting speeds and drill more out-to-gauge hole. Now you can use this same alloy to greatly prolong the life of your tool joints!

An exceedingly small quantity of Tube Borium welded in a ring around the shoulder not only doubles tool joint life—even under the toughest operating conditions—but maintains over all joint strength and correct elevator contour. Applications are economically made on both new and resleeved joints.

APPLICATION: Accepted method of application is to under-cut new or resleeved joints at the shoulder to form a recess ⅛" deep by 1½" wide. The recess is then filled by welding in with 5/16" Electric Tube Borium to form the wear resistant inlay.

Write for this special Stoody engineering bulletin describing in detail hard-facing procedures on tool joints—no obligation.

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Retard wear... Save Repair

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H. P. FOGLE

D. L. COLLINS

E. R. ATKINS

W. W. FOSTER

W. F. TIEMANN

Equipment Men in News

Paul H. Shepherd, formerly assistant division manager of Oil Well Supply Co., at Fort Worth, has been appointed assistant Midwest division manager with supervision of the Coastal area comprising South Texas, Southwest Texas, Gulf Coast, Southern Louisiana and Mississippi areas. His headquarters will be at Houston. **Howell P. Fogle,** formerly district manager in the Southwest Texas district, San Antonio, has been appointed division tubular representative with headquarters at Houston. His position in San Antonio has been filled by **W. P. Clements, Jr.,** until recently representing Oil Well Supply in Western Canada. **Don L. Collins,** formerly manager of machinery sales in Oklahoma City, becomes manager of machinery sales for the Midwest Division, with headquarters at Houston. **Carl C. Egner,** formerly assistant division manager at Houston, has been named manager of pipe-line equipment sales, a unit of the general sales department, Dallas. **Allen F. Pitts** of Dallas has been advanced to manager of refinery sales, and will continue to make his headquarters in Dallas. He will be assisted by **Walter Williams,** district engineer for the refinery division at Houston. **D. O. Smith,** formerly district engineer at Evansville, Ind., has been appointed training section supervisor of the general sales department, Dallas.

Earle R. "Pop" Atkins has been appointed California representative for Rector Well Equipment Co., Fort Worth and Houston, Tex. He has offices in the W. W. Wilson Building, Huntington Park, Calif.

W. W. (Wick) Foster has been appointed sales manager for the Southwest region by Plomb Tool Co., Los Angeles. The territory he will supervise includes California, western Nevada, Arizona, and New Mexico.

Willis F. Tiemann has been appointed works manager of the Superior Engine Division of The National Supply Co. at Springfield, Ohio. He replaces **John D. Spalding** who resumes his former duties as works manager of National's Torrance, Calif., plant.

Mack Huffaker has been appointed manager of the engine division for The Industrial Supply Co. of Wichita Falls, Tex., distributors for Continental Red Seal Engines.

C. W. Patterson has been named sales engineer for Detroit Diesel Engine division, General Motors Corp. He will make his headquarters in Tulsa, Okla., on the staff of **Arch F. Campbell,** manager of General Motors' Petroleum Industry Sales department.

W. O. Bates, Jr., vice president of Caterpillar Tractor Co., Peoria, Ill., has moved to San Leandro, Calif., to assume full-time administrative responsibilities as manager of the Caterpillar offices and plant there. He was appointed San Leandro manager early this year, but has divided the intervening time between the California plant and the company's subsidiary, Caterpillar Military Engine Co. of Decatur, Ill., where since November 1942 he has served as a vice president.

John E. Ford, Jr., has joined Houdry Process Corp. as executive assistant to **Robert B. Cragin,** vice president in charge of commercial development. Previously for 8 years he was with M. W. Kellogg Co. Houdry also announces the appointment of **Gordon A. Kessler,** patent attorney, who will head the corporation's patent division. He will make his headquarters in the Lewis Tower Building, Philadelphia, Pa.

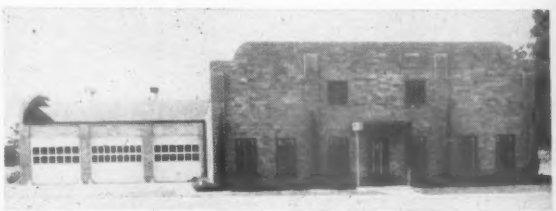
Francis J. Curtis, St. Louis, vice president of Monsanto Chemical Co., has been elected chairman of the American Section of the Society of Chemical Industry, an English organization of industrial chemists. Curtis is also vice chairman of the Division of Industrial and Engineering Chemistry, American Chemical Society, and a director of the American Institute of Chemical Engineers.

Eastman Oil Well Survey Co. announces the opening of a field service office at Brookhaven, Miss. **Fletcher Pickens,** field sales and service representative, formerly stationed at Homer, La., will supervise the Mississippi area.

The board of directors of General Motors Corp. has elected **Lt. Gen. William S. Knudsen** a member of the board, from which he had resigned September 3, 1940, after having entered the service of the Government in the national-defense program. The board also elected **Col. Graeme K. Howard** a vice president of the corporation.

W. C. Perkins, who has been associated with American Chain & Cable Co., Inc., for years, has relinquished his duties as district sales manager of the Pittsburgh territory of the American Chain Division. He will continue with the company as a special representative with headquarters at York, Pa. **W. M. Cusack,** who has been district sales manager at Detroit, has moved his headquarters to Empire Building, Pittsburgh, and is now district sales manager of the American Chain Division, Pittsburgh district. **C. A. Goldstrohm,** who recently returned to the company after serving with WPB in Washington, has been appointed district sales manager of the Southern district. His headquarters will be at York, Pa.

C. D. Fletcher, sales manager of Oil Lift Supply Co., Longview, Tex., joined the company a month ago. He was formerly with American Manufacturing Co., of Fort Worth, Tex., as manager of the commercial division. He has been identified with the oil industry for 18 years.



New home of Oil Lift Supply Co., Longview, Tex.

M. HUFFAKER

C. W. PATTERSON

W. O. BATES, JR.

J. E. FORD, JR.

G. A. KESSLER

C. D. FLETCHER